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MUNICIPAL ENGINEERING

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THE NEW FILTRATION WORKS IN PHILADELPHIA.

By J. A. Stewart, Philadelphia, Pa.

Philadelphia is at present engaged in an interesting expansion of its great waterworks system at a probable cost of $35,000,000, which will equip that city with the most extensive filtration plant in the United States, if not in the world.

Few people realize the extent of the project which the city has adopted. The plans involve utilizing the Delaware with its magnificent watershed of 8,600 square miles, as well as that of the Schuylkill, making a grand total of over 10,000 square miles of watershed. The plans include provisions for fifty years, when the population of Philadelphia will probably include 3,000,000 people.

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INTERIOR ON PHILADELPHIA FILTER GALLERY.

For the past century the entire water supply of the city, with the exception of but 5 per cent., has been taken from the Schuylkill river, which is tidal as far as Philadelphia, the flow of the tide being stopped by the Fairmount dam. At the minimum summer flow, no more than 150,000,000 gallons of water daily may be taken from the river, a supply insufficient for 1,300,000 people. The great growth of population and of mining operations in which water is used, and the progress of settlement and cultivation of the land have brought about a great change in the character of the Schuylkill's water during the past half century. Sanitary surveys have continually shown that the river is seriously polluted by contamination of the worst kind from sewage, privies, coal dust, etc. The amount of suspended matter has reached 1,026 parts per 1,000,000 parts of water and 3,000 bacteria have been found to a centimeter of water.

The Delaware river, to which the city now turns for the augmentation of its water provision, is a tidal estuary at Philadelphia, and its supply of water is practically unlimited. Its principal source of pollution is the city itself, whose sewage it receives below the proposed location of the new intakes.

Owing to the impurity of these water sources, it is not surprising that filtration has been rendered necessary. The great work of purification will be carried on in a plant now in course of construction, which when finished will probably be the

largest and most complete of the kind anywhere.

It comprises the building of filter beds, of filtered water basins, sedimentation basins, a testing station and appurtenances, a gravity conduit, new lines of mains, new machinery, etc. The parts of the new filtration system are located in four different sections of the city on lands adjoining the existing reservoirs at Roxborough, Belmont and Queen Lane, and a complete new construction on the Delaware river near Torresdale.

In order to make an investigation into the effects of Schuylkill river water upon slow sand filters, to examine in detail its chemical and bacterial constituents as well as to study the various local sands, a testing station was first constructed. test filters there was placed at the bottom of the filter a tile drain six inches in diameter, laid with joints open one and a half inches in the clear and surrounded by a layer of broken stone. Underdraining material one foot in total depth was next placed in layers of broken stone, screened gravel and sand; above it there were placed four one-foot layers and one six-inch layer of screened and washed bank sand from Birmingham, N. J. The sand settled, giving an average depth of four feet three inches. Other test filters have been constructed and operated in which asbestos to the amount of 1½ pounds to the square yard has been spread upon the surface; crushed porous furnace slag has been tried as a filtering medium for the removing of suspended matter, as also filters with alternate bottom layers

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PHILADELPHIA COVERED FILTER UNDER CONSTRUCTION.

This preliminary plant, located on the high ground immediately north of the Spring Garden pumping station, consisted of two 30,000-gallon concrete sedimentation basins, two slow sand filters with an area each of one-tenth of an acre, two concrete filter basins for experiments relative to preliminary filtration, and two concrete filter beds. The whole was inclosed in a wooden building with chemical and bacteriological laboratories on the upper floor. Outside the building a sand washer was constructed. For a year or more filtration tests have been carried on at the testing station, not only with the now well-known types of slow sand filter beds, but also with beds of different materials designed to hasten the rate at which water can be clarified and freed from bacteria.

In the construction of the slow sand of coke and slate and upper courses of broken stone and coke breeze. Water of crystalline clearness has been displayed by the department of public works recently as a result of these tests, with the statement that it had been filtered at the rate of 6 million gallons per day per acre of filtering surface; and that it is of the quality that will be furnished the people of Philadelphia when the works under construction are completed.

The portion of the great work nearest completion is that adjacent to lower Roxborough reservoir in the 21st ward. The plant at this point consists of five covered filters, with a court for the storage and washing of filter sand and a covered concrete filtered water basin with a capacity of 3,000,000 gallons. The floors of the filters are built of concrete in the form of inverted groined arches, 6 inches thick at the center, 14 inches thick under

the piers and on a puddle lining. The puddle lining consists of a mixture of clay and sandy gravel and is carried up around the outside walls to a point above the water line of the filters. The piers are concrete monoliths 22 inches square at the top and spreading out to 2 ft. 10 inches square from the sand line to the base. The outside walls are also of concrete. The exposed faces of the piers and of the outside and dividing walls below the sand line are floated with a thin plaster of Portland cement mixed three to one, and dashed with sand before the plaster has set—to afford a rough surface for the sand to press against and to prevent a downward filtration of the water. Concrete vaulted roofs cover both basins and filter beds. The vaulting is in the form of semi-elliptical groined arches 14 feet span, 3 feet rise, 6 inches thick at the crown and 21 inches thick over the piers. Ventilator shafts are provided for the admission of light and air during scraping. On top of the vaulting is a 4-inch layer of sand and gravel for conveying rain water to the drains leading down through the piers and dividing walls to a point just above the sand level. The 24-inch collecting drains extend the entire length of each filter and are built entirely of concrete. The 6-inch lateral collectors enter this system at the top through a special branch. Each filter is provided with a sand incline and run for the purpose of removing the dirty sand and replacing it with the clean material. Each filter measures 109 feet by 219 feet 10 inches and has a net filtering area of 0.537 acres. The total capacity of the plant is 6,400,000 gallons daily.

It has been a task of great magnitude to transport the materials required to the top of the great hill upon which the Lower Roxborough filter beds are constructed. The contractors built a trolley line a mile in length to carry up building materials. In addition to the ten flat cars run on that road, 100 four-horse teams were required to carry up from the railroad the stone, sand and gravel for the five-foot filtering layer. The total cost of this part of the construction was $250,000, and it will supply water to the lower part of Germantown, Manayunk and the falls of Schuylkill.

The upper Roxborough plant, to supply the higher parts of Germantown and Chestnut hill, will require an expenditure of half a million dollars.

The Belmont works are twice the size of the two Roxborough plants put together. The construction of the great sedimentation basins at this point is well under way, in which the water, as it is pumped up from the river will be allowed to settle before going to the filters. About one year more will be required to complete the plant, which when finished will supply filtered water to all West Philadelphia, an amount of about thirty million gallons daily.

By far the most important and extensive part of the construction is that going on near Torresdale on the banks of the Delaware river. The filter beds at this point, where water supply is practically limited, will have ultimately a daily capacity of 200,000,000 gallons. There are no sedimentation basins planned for the Delaware river water, which will be pumped directly from the river by the low lift pumps to the filter beds. From the filters the water will run through the great underground conduit to the pumping station at Lardner's Point, whence it will be forced through the distribution mains by means of the Wentz Farm system of distribution, any excess going into the new reservoir at Oak Lane. Six lines of 48-inch mains are to be laid from Lardner's Point to connect with the general distribution system at various points. Only preliminary work has as yet been done on this great filtration site, which requires more than two years for its construction and involves at the outset an expenditure of $4,000,000.

When the Torresdale plant is completed there will be an abandonment of the pumping stations on the Schuylkill, except the one at Belmont, which will continue to supply West Philadelphia, and the one at Shawmont, which supplies Manayunk, Germantown and Chestnut Hill. The city proper will then be supplied from the Delaware, for the Torresdale plant is intended to provide for all the districts now supplied from Wentz Farm, East Park and Spring Garden reservoirs, and two-thirds of that from Queen Lane. All the pumps from Queen Lane will be moved to Lardner's Point and some of the pumps from Spring Garden station to Queen Lane, enabling the water department to keep the Queen Lane basin full for emergencies, or for use after long sedimentation, which can be given it under such circumstances.

It is expected that some parts of the city will receive the benefit of filtered water at an early date. Then it will flow in ever-increasing quantities until the entire task is completed. The ultimate expansion and improvement involves a supply of 450,000,000 gallons daily at an annual cost for maintenance of $2,972,000.

SOME DETROIT PAVING WORK.

The report of the Commissioner of Public Works of Detroit, Mich., Mr. D. W. H. Moreland, which is reviewed elsewhere in this number, shows the important position of cedar block paving in that city. The material has been used in Michigan cities for many years, and the blocks have been laid on sand, planks and concrete. Of cedar block on sand there are 45.0 miles, of the same on sand with stone gutters there are 5.9 miles, on plank 40.3 miles, and on concrete 136.4 miles. The cheaper forms of the improvement correspond to gravel streets or cheap macadam streets in cities where wood is not so accessible. They cost but little more (50.8 cents per square yard in 1901), are quite as expensive to keep in repair and last but little, if any, longer.

A large part of the repair work done by the department is upon these streets. If cedar block streets and wooden sidewalks were eliminated most of the vexing details of repair work would disappear. In the year ending June 30, 1902, 140,482 square yards of resurfacing was done at a cost of $71,386.82. Two streets were entirely reconstructed from the resurfacing and repair fund, one of 996 square yards of cedar blocks on concrete, costing $1.54 a square yard, and one of 941 square yards of asphalt block on concrete foundation at a cost of $3.14 a square yard.

The small illustration accompanying shows the process of tearing up an old block pavement. Another shows the resurfacing gang at work upon Twelfth-st., and a third shows the completed pavement on Parker-ave. The method of doing the work and the character of the finished pavement are well shown by these pictures. Still another of the illustrations shows the completed asphalt block pavement on Fourth ave., and makes clear the contrast at the beginning between the two classes of pavement. The durability of the latter material will cause the difference to become more pronounced each year, and it is probable that the greater bills for repairs of the cheaper pavement will soon offset the greater first cost of the good surface.

The accompanying cross sections show the foundations required for each class of pavement, cedar, brick or asphalt block and sheet asphalt, with the crowns and depths of gutter for a twenty-six-foot width of paved surface.

Very nearly eighteen miles of the 23.4 miles of street and alley paving and repaving done in the year of the report was with cedar. Of that classed as paving seven miles in eight and one-fourth were of cedar on concrete. In the city there are 285.9 miles of paved streets, of which 227.5 are cedar.

The cost per square yard of all classes of pavements was greater than the previous year in all cases except asphalt, the increase in net cost per square yard being from 5 to 10 per cent. The prices for asphalt were reduced nearly 20 per cent., except asphalt block, which remained stationary in price. The cost of cedar timber is increasing from year to year and the poor economy of using that material is shown by the comparison of net cost per square yard as follows:

Cedar repaving (on concrete)	$1 05
Cedar paving on concrete	1 13
Brick repaving (on concrete)	1 56
Asphalt on concrete, paving and repaving	1 60
Brick paving on concrete	1 65
Asphalt block repaving (on concrete)	2 30

The large amount of material required

CEDAR BLOCK RESURFACING. TWELFTH STREET, DETROIT, MICH.

for the street and sidewalk repairs requires two yards for the storage and preparation of material, one in the eastern part of the city and one in the west. Each costs about $5,000 a year to maintain, and is an indispensable adjunct of the system. The view of the western supply yard, which is given herewith, is evidence of this. The flower bed in another photograph fills an unoccupied corner with a refreshing spot in contrast with the strict utilitarian uses of the rest of the yard.

This report covers the first full year of the department under a single commissioner. An excellent photograph of Commissioner Moreland is given our readers, most of whom are already familiar with his name. His efficiency was demonstrated some years ago when he was chairman of a board of public works of three members, and the change to a single head for the department is proving to be a fortunate one, under his direction.

Mr. Moreland also has charge of the construction, repair and cleaning of sewers, with which the city of Detroit is well provided. His particular favorite is the department of street cleaning, and his organization of this work with its force of "white wings" is favorably known everywhere. The paper by Mr. Moreland on "The Gospel of Cleanliness," which appeared in Municipal Engineering September, 1902, is reprinted in the report, and is the most concise statement of his system which has appeared.

THE COST OF ELECTRIC LIGHT AND ELECTRIC LIGHT PLANTS TO MUNICIPALITIES.

There are two sources of unbiased information concerning the operation of municipal and private electric lighting plants, viz.: the reports of the Board of Gas and Electric Light Commissioners of the commonwealth of Massachusetts, appearing each year, and the fourteenth report of the United States Commissioner of Labor on water, gas and electric light plants.

Inquiries regarding the comparative cost of electric light under municipal ownership of lighting plants and under contract from private plants led to the selection and comparison of data from these two sources, particularly with reference to cities of about 50,000 population. A paragraph on the cost of installing a municipal plant is also added.

The former series of reports permits comparisons from year to year, but the data must be combined and digested in order to make the comparisons desired. The latter report is anonymous so far as the location of the plants reported on is concerned. The data for the Massachusetts plants are very complete and those in the national report are in most instances very nearly as complete, but probably not quite so reliable as those of the state commission which, under the law, has very close supervision of the companies furnishing gas and electric light and of the municipalities operating their own plants.

Averages of the data in the Labor Commissioner's report are given in his discussion of the tables. There are four items regarding electric lighting on which comparisons may be made in one or both of the publications referred to; the prices charged in plants under private ownership for lights furnished to private persons, and to municipalities, the prices charged in plants under municipal ownership for lights furnished to private persons, and the cost to the municipalities of lights furnished for public use. These data are given for arc lighting and for incandescent lighting and are reduced to averages with the utmost accuracy possible under the various systems of charging for service in vogue.

The prices charged are definite, usually, and can be reduced to a basis for comparison with comparative ease. The cost to the municipality of public light furnished by its own plant can only be obtained by rather extended computations. In the data from Massachusetts the cost is obtained by adding the operating expenses of the electrical department, the interest on the investment in the electrical plant at the rate paid on town bonds, and depreciation at 5 per cent., and deducting from this sum the income from private consumers for electric current sold to them. In the data from the labor commissioner's report the same process is used, but the interest on the investment is not included, as that is apparently considered to be an advantage accruing to municipal ownership. Data are given, however, for increasing the apparent cost by the amount of this interest, estimated taxes and free service.

The following table gives these data in convenient form for comparisons, the figures from the Labor Commissioner's report being for plants having engines of 1,000 to 1,500 horse-power, approximately

CEDAR BLOCK PAVEMENT. PARKER AVENUE, DETROIT, MICH.

the size of plant necessary for a city of 50,000 population under ordinary conditions.

ARC LIGHTING.

—Private Plants—

Price to Private Users—
From U. S. Report:
$159.32 for 3,250 to 3,500 hours a year,
10.56 cents per kilowatt hour.
Price to Municipalities—
From Mass. Report:
$95.24 per lamp per year,
15.3* cents per kilowatt hour.
From U. S. Report:
$94.12 for 3,250 to 3,500 hours a year,
5.21 cents per kilowatt hour.

—Municipal Plants—

Price to Private Users—
From U. S. Report:
$50.00 for 3,250 to 3,500 hours a year,
6.98 cents per kilowatt hour.
Cost to Municipalities—
From Mass. Report:
$84.34 per lamp per year,
10.8** cents per kilowatt hour.
From U. S. Report:
$34.66 for 3,250 to 3,500 hours a year,
4.18 cents per kilowatt hour.

INCANDESCENT LIGHTING.

—Private Plants—

Price to Private Users—
From U. S. Report:
15.38 cents per kilowatt hour.
Price to Municipalities—
From Mass. Report:
$21.20 per lamp per year,
10.0* cents per kilowatt hour.
From U. S. Report:
$11.98 per lamp per year.

—Municipal Plants—

Price to Private Users—
From U. S. Report:
10.83 cents per kilowatt hour.
Cost to Municipalities—
From Mass. Report:
$18.80 per lamp per year,
10.8** cents per kilowatt hour.
From U. S. Report:
$3.32 per lamp per year.

It is evident in every instance that the cost of electric light in a municipal plant is less than in a private plant.

The figures from Massachusetts given in cents per kilowatt hour are from an article by Alton D. Adams in Municipal Engineering, vol xxiii, p. 160, and are derived from the data in the Massachusetts report by careful computation. They compare the cost of electric light in three towns having combined electric and gas plants under municipal ownership with that in nine towns having similar private plants.

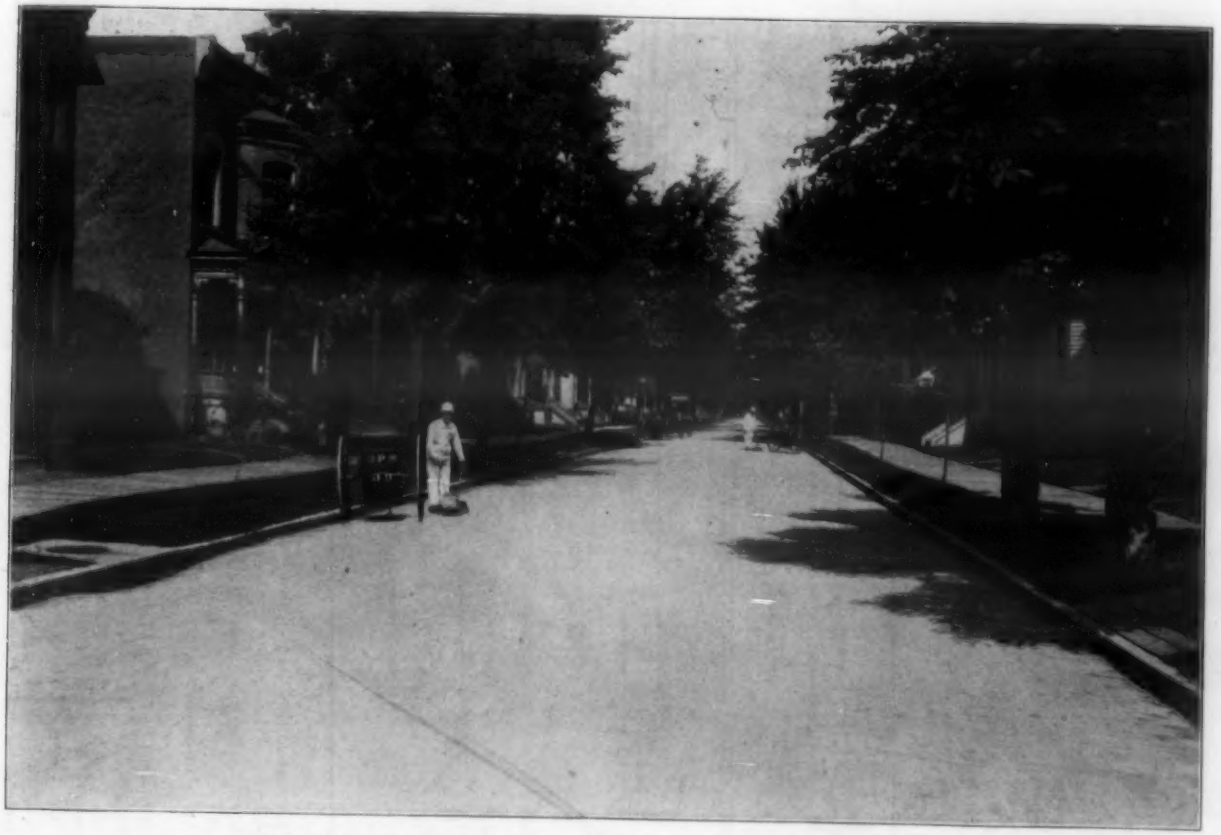
The figures from the same report given in dollars per lamp per year are not so carefully derived. Those for private plants are the averages of the schedule prices for lights paid by municipalities without reference to the candlepower of lamps or the number of hours they are burned in a year. There are twenty-five cities and towns in the average of arc light prices. Those for municipal plants are the averages of costs in fifteen cities and towns for arc lights and thirteen cities and towns for incandescent lights. The cost in each city is derived in the manner sketched above for the candle power of the lamps used, and the averages are taken for each class of lamps, arc and incandescent, without reference to this candle power or to the number of hours they are burned in a year. Some of the data for the reduction to cents per kilowatt hour are given in the report and indicate that the computation, if it could be made, would make the difference between cost in municipal and private plants greater than that shown.

The tables in the Labor Commissioner's report, from which the above figures were taken, show the same excess of cost in private plants over cost in municipal plants for both private and public service in the sixteen classes of plants from those having engines of less than 50 horse power to those having engines of over 5,000 horse power with but two or three exceptions. The tables will also be found in Municipal Engineering, Vol. xix. p. 255.

There have been several reports upon the differences in cost of electric light under municipal and private ownership which are not so authoritative as those mentioned for they did not take account of all the conditions and were frequently prepared by persons with undue prejudice in favor of or against municipal ownership. Among those which have been abstracted for Municipal Engineering may be mentioned those in vol. viii, pp. 195 and 319; x, 124, 406; xii, 377; xiv, 152; xvi, 321; xviii, 124, 147; xx, 33, 236; xxi, 76, 347, 387; xxii, 106, 322, 331, 370, 415, 418; xxiii, 160, 168, 363, 364. It is not possible to draw any definite conclusions from these reports for the reasons stated above, but their study will be of value in gaining the ability to recognize the factors which must be considered and the weights to be given them. A detailed report by the city electrician of Chicago of the growth of the municipal plant in that city and its effect upon contract rates for municipal lighting, and an editorial discussion of the same will be found in vol. xx, pp. 33 and 344, showing what can be done in this direction under rather unfavorable circumstances. On page 376, vol. xxii, will be found a review of a report

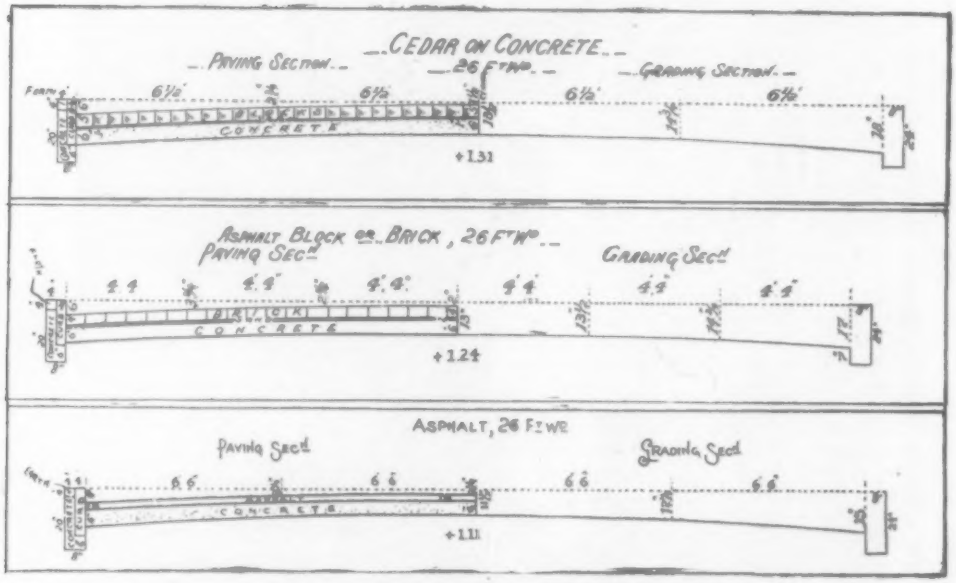
*The average of the price in private plants to municipalities for arc and incandescent lights is 13.6 cents per kilowatt hour, as compared with the average cost of 10.8 cents in municipal plants given above.

**Average of both arc and incandescent cost.



ASPHALT BLOCK PAVEMENT. FOURTH AVENUE, DETROIT, MICH.

in Municipal Affairs, spring number, 1902, which discusses the same plant and its history, demonstrating that the lighting rates have been very materially decreased in the thirteen years of operation and that more than the average excess of cost of the light furnished by the municipal plant over these reduced contract prices, amounting to less than $4,000 a year, has been expended in reducing the hours of labor and increasing its wages, thus showing that under the same conditions in this regard the plant would have shown a profit over prices of lights purchased by contract. Private rates of the commercial plants show similar reductions to those for lights furnished the city, though the city cannot, under the Illinois



CROSS SECTIONS OF DETROIT STREETS.

constitution, engage in commercial lighting. In these reports all possible allowance for taxes, interest, depreciation, etc., seem to have been made.

In an article on the "Cost of Light from the Electric Arc," by Alton D. Adams, in vol. xvii, p. 65, a comparison is made between the cost of running enclosed and open arc lights, and it is stated that the yearly charge for operating a 330-watt open arc lamp is $38.13, with the enclosed arc lamp $10.43 less. This does not include interest, depreciation and repairs as maintenance charges, but simply operation of plant and furnishing of supplies. At the low meter rate of 4 cents per kilowatt hour one of these lights would use $70 worth of current in a 4,000-hour year. On page 185 of the same volume is an article by the same author on incandescent lighting cost, in which a rate of 7 cents per kilowatt hour is assumed as sufficient charge for current to allow for all items of operation, maintenance, depreciation, interest, etc., of the plant, and its cost for a 16 candle-power lamp for a 3,828-hour year is computed at $13.40. Additions for lamp renewals, lamp fixture charges, etc., make the cost per lamp per year $17.86. These theoretical figures may be compared with the actual figures in the above table as a mutual check.

The general principles upon which the decision of the question of municipal and private ownership of electric light plants is based are discussed in several articles and editorials in this magazine, such as those found in vol. viii, p. 18; xiii, 357; xiv, 11; xvi, 387; xvii, 343; xix, 32; xxiii, 168. The points in these articles may be summarized as follows: There is little difference in permanency in office in favor of private ownership. The effects of political manipulation must be considered independently of the question of municipal ownership. There are opportunities for corruption in either case, and those opportunities in the case of private ownership stand in the way of the proposed plan of private ownership with municipal control of issues of stock and bonds, interest, rates, etc. The contention in the article in vol. xvi, p. 321, that the movement toward municipal ownership finds its source in the idea that "private ownership of property is

WESTERN SUPPLY YARD. DETROIT, MICH.

immoral" has no basis of fact. Municipal ownership, at least in this country, is proposed only for such public services as give rise to practical monopolies which should never be given into the control of individuals. Figures showing the relative cost under the two plans are only of local application and every item must be considered in all its relations to the local conditions. The entire question must be considered as a local one and the advantages and disadvantages of either plan for the particular locality must be carefully balanced, the experience in other cities being used only to throw light upon the problem and not as an example to be followed blindly. Nepotism, favoritism and politics enter into the management and operation of both municipal and private plants, on the whole with less deleterious effect in the latter. Civil service will aid the municipal works. Publicity of accounts would remove some objections to private ownership, enabling the retention of its advantages. Unless taken honestly from unbiased sources, figures of relative cost under the two systems must be accepted with caution.

Regarding the cost of municipal electric light plants there are some data in the Labor Commissioner's report. There are four municipal plants having engines with 1,000 to 1,500 horse power, listed in the tables. The cost of these four plants is as follows:

For 1,030 horse power, total cost, $163,000; annual expenses, $44,752.

For 1,050 horse power, total cost, $150,000; annual expenses, $30,851.

For 1,300 horse power, total cost, $225,000; annual expenses, $33,728.

For 1,180 horse power, total cost, $109,048; annual expenses, $14 812.

The details of items are given in this magazine, vol. xxii, p. 158.

The equipment of municipal electric light plants in Massachusetts is discussed by A. D. Adams in vol. xxiii, p. 434.

The volume of proceedings of the American Society of Municipal Improvements for 1896 has a large table giving many data regarding details of equipment and operation of electric lighting systems which will be of interest in considering the adoption of details. The volume for 1899 contains a number of reports of the cost of furnishing arc lights in many cities. Private plants in twenty-nine cities furnished 1,200 candle-power lights for street lighting at an average price of 2.73 cents per lamp hour or $90 per lamp per 3,300 hour year, and seventy-eight cities furnished 2,000 candle-power lamps at an average price of 2.81 cents per lamp hour, or $92.73 per lamp per 3,300 hour year. In municipal plants in twenty-five cities the average cost of 2,000 candle-power lamps, with 5 per cent. allowance for interest and 4 per cent. for depreciation, is 2.17 cents per lamp hour, or $74.91 per lamp per 3,300 hour year.

STRENGTH OF CONCRETE WITH VARIOUS AGGREGATES.

Several correspondents have requested information regarding the strength of concrete made of various materials and the accompanying tables are presented as a partial answer to the question. It has long been one of some interest to engineers, but not sufficiently pressing to lead to many experiments with a view to a definite answer to any large part of it.

There are many variables in a concrete test, all of which have effect upon results, so that unless the tests are made with all the variables but that of the kind of material used for the aggregates eliminated, their effect may be nearly or quite concealed. One of these variables is the personal equation of the experimenters. In the tables given nearly all the tests for crushing strength were made at the United States government testing station at Watertown and variations due to personal equation of machine and operator are nearly eliminated. The cubes were made by various persons as noted below, so that there is here a chance for some variation. The size of test pieces is also a factor causing some variation. With a few exceptions the results in the table have been derived from tests of cubes twelve inches in each dimension.

The tests were made for various purposes as follows:

The concrete cubes from the state of New York were made to test the value of various local cements, to determine the variation in strength due to mixing the concrete with dry mortar, with plastic mortar and with mortar having an excess of water, the variation in strength due to various treatment of the cubes, such as setting in water, in sand, in damp air, etc., and to determine the variation in strength of concrete with that in proportion of cement to sand and of mortar to stone. The results used have all been averaged without reference to any of these variables, except that of proportion of cement to sand in the mortar, the individual results varying but

little with the variation in the other conditions. They are taken from a paper by G. W. Rafter before the American Society of Civil Engineers and are credited in the accompanying tables to Mr. Rafter, who made the cubes. The individual results will be found in the paper referred to in part, in the report of the New York State Engineer for 1898 and in the report of tests at the Watertown arsenal for 1898. All are on 12-inch cubes. One set is from the 1899 report on prisms 8 by 8 inches by 12 inches high furnished by the Boston Rapid Transit commission, and another set is on cubes furnished by the Cleveland water works and reported in the 1900 volume. Some cubes furnished by the Contractors' Plant Company were apparently prepared to show the difference between hand and machine mixing. They are reported in the 1900 volume.

The cinder concrete tests were made on 12-inch cubes and the individual results will be found in the 1898 Watertown report.

Most of the trap rock tests were reported in the same volume, but some are taken from the volume for 1899. They are upon 12-inch cubes and the variables not considered in making the averages given in the tables are the sizes of the stones in the aggregate and the brand of cement used. The tests of pebble concrete and of mixtures of trap and pebble and trap, pebbles and gravel are taken from the same series.

The results of tests of conglomerate cubes are taken from the report of tests at the Watertown arsenal for 1899. These cubes are made by George A. Kimball of the Boston Elevated Railway Company, from conglomerate of Roxbury, Mass., mixed in the ordinary manner on construction work, as what would usually be called dry concrete, moisture or water flushing slightly to the surface on ramming. They were apparently subjected to the freezing and thawing of the weather at the time of manfacture and this effect is included in the results, all the cubes being subjected to the same treatment.

FLOWER BED IN SUPPLY YARD. DETROIT, MICH.

The results for broken brick are taken from the 1899 volume, two sets of cubes being made at the Watertown arsenal and the other at Key West, Fla.

The slag tests were made on 12-inch cubes furnished by the Cleveland water works and are reported in the 1900 volume of tests at Watertown.

A few results of tests of gravel concrete on the authority of Dyckerhoff, the German cement manufacturer, are added from Newberry's paper on concrete in the proceedings of the Indiana Engineering Society.

The results credited to A. W. Dow in the tables are taken from reports of tests

made by him for the Engineer Department of the District of Columbia, comparing gravel and broken stone and mixtures of the two for concrete. The results credited to Baker are from his book on "Masonry Construction." Those noted as 75 per cent., 100 per cent. and 125 per cent. voids filled are from experiments on various proportions for concrete made by students of the University of Illinois.

Some tests of stone used for making concrete are added for comparison with the concrete made from these materials. These results are from the volumes of reports of Watertown tests named.

All the results are for Portland cement. The number of tests using natural hydraulic cement was quite small and a comparison would be of even less value than that made of the Portland cement samples.

Due attention being paid to the effect of the several variables mentioned and to some others, a little information of interest can be gathered from the tables.

Mr. Rafter's experiments seem to show that within their limits the strength of the concrete varies with the strength of the mortar. All his results with the same mortar have therefore been put into one average, though the proportion of stone varies in one case as much as from 3.9 to 6.5 to one part of cement. Comparisons can be made of aggregates within these limits of variation. The time of hardening, within the limits shown in the tables, seems to have considerable influence. The difficulties of comparison are great on account of the lack of uniform-

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STRENGTH OF CONCRETE OF VARIOUS AGGREGATES.

Data from 1898, 1899 and 1900, Reports of Tests at Watertown Arsenal, except as noted.

I. Mortar of 1 Portland Cement, 1 Sand, and Aggregate as Stated in First Column.

Aggregate.	Kind of Stone.	Age of Cube.	No. of Samples.	Av. Comp. Strength.	Authority.
1½	trap	11 to 43 da.	4	3944	U. S. 1898.
3	trap	7 to 11 da.	9	2442	U. S. 1898.
3	trap	19 to 26 da.	9	3346	U. S. 1898.
3	trap	31 to 48 da.	10	3676	U. S. 1898.
3	trap	61 to 76 da.	7	4591	U. S. 1898.
3	trap	4 mo.	6	3079	U. S. 1899.
3	pebbles	7 to 11 da.	4	2092	U. S. 1898.
3	pebbles	21 to 26 da.	4	3052	U. S. 1898.
3	pebbles	29 to 46 da.	5	3642	U. S. 1898.
3	pebbles	61 to 70 da.	3	3793	U. S. 1898.
3	cinder	29 to 39 da.	18	1544	U. S. 1898.
3	cinder	90 to 102 da.	15	2186	U. S. 1898.
3	2 trap, 1 gravel	7 da.	1	1800	U. S. 1898.
3	2 trap, 1 gravel	23 da.	1	3806	U. S. 1898.
3	2 trap, 1 gravel	32 da.	1	5024	U. S. 1898.
3	2 trap, 1 gravel	67 da.	1	4700	U. S. 1898.
3	2 pebbles, 1 gravel	7 da.	1	1486	U. S. 1898.
3	2 pebbles, 1 gravel	22 da.	1	2676	U. S. 1898.
3	2 pebbles, 1 gravel	32 da.	1	3000	U. S. 1898.
3	2 pebbles, 1 gravel	65 da.	1	3800	U. S. 1898.
3	1 trap, 1 pebble, 1 gravel	7 da.	1	1520	U. S. 1898.
3	1 trap, 1 pebble, 1 gravel	22 da.	1	2800	U. S. 1898.
3	1 trap, 1 pebble, 1 gravel	32 da.	1	2700	U. S. 1898.
3.9 to 6.5	broken stone	19 to 22 mo.	64	3334	Rafter.

II. Mortar of 1 Portland Cement, 2 Sand.

2	trap	3 mo.	8	1984	U. S. 1899.
2	trap	4 mo.	4	2834	U. S. 1899.
3	trap	3 mo.	10	2030	U. S. 1899.
3	trap	4 mo.	5	2809	U. S. 1899.
3	gravel	28 da.	....	2125	Dyckerhoff.
3	cinder	39 da.	3	1098	U. S. 1898.
3	cinder	102 da.	3	1634	U. S. 1898.
4	trap	3 mo.	10	1957	U. S. 1899.
4	trap	4 mo.	16	2244	U. S. 1898.
4	granite	28 da.	2	1607	U. S. 1899.
4	pebbles	3 mo.	5	3206	U. S. 1898.
4	conglomerate	7 to 10 da.	25	1565	U. S. 1899.
4	conglomerate	1 mo.	30	2399	U. S. 1899.
4	conglomerate	3 mo.	30	2896	U. S. 1899.
4	conglomerate	6 mo.	26	3796	U. S. 1899.
4	slag	52 da.	8	3392	U. S. 1900.
4	slag	85 da.	8	4135	U. S. 1900.
4	cinder	38 da.	3	904	U. S. 1898.
4	cinder	98 da.	3	1325	U. S. 1898.
4	brick	28 da.	6	720	U. S. 1899.
4	brick	3 mo.	5	2757	U. S. 1899.
4	limestone	6 da.	4	1084	U. S. 1899.
4	limestone	11 to 13 da.	8	1676	U. S. 1899.
4	limestone	19 to 20 da.	6	2049	U. S. 1899.
4	limestone	52 da.	5	3604	U. S. 1900.
4	limestone	85 da.	5	4256	U. S. 1900.
5	trap	3 mo.	12	2270	U. S. 1899.
5	trap	4 mo.	6	2821	U. S. 1899.
5	gravel	28 da.	....	2387	Dyckerhoff.
5	cinder	29 to 38 da.	15	724	U. S. 1898.
5	cinder	90 to 101 da.	15	1081	U. S. 1898.
voids filled	gravel	1 to 2½ mo.	7	1477	Baker.
voids filled	gravel	5 to 8 mo.	2	1742	Baker.
voids filled	gravel	12 to 15 mo.	2	4583	Baker.
voids filled	gravel	20 to 30 mo.	6	2278	Baker.
voids filled	gravel	32 to 36 mo.	3	2365	Baker.
voids filled	gravel	35 to 36 mo.	2	3497	Baker.
6	trap	3 mo.	13	1869	U. S. 1899.
6	trap	4 mo.	7	2411	U. S. 1899.
6	gravel	10 da.	....	694	A. W. Dow.
7	trap	3 mo.	15	1466	U. S. 1899.

STRENGTH OF CONCRETE—*Continued.*

II. Mortar of 1 Portland Cement, 2 Sand—*Continued.*

Aggregate.	Kind of Stone.	Age of Cube.	No. of Samples.	Av. Comp. Strength.	Authority.
7	3 gravel, 4 stone	6 mo.	....	2000	Baker.
7	3 gravel, 4 stone	32 to 37 mo.	6	4428	Baker.
8	trap	3 mo.	18	1163	U. S. 1899.
9	trap	3 mo.	10	816	U. S. 1899.
5.18 to 8.93	limestone	19 to 22 mo.	128	2678	Rafter.

III. Mortar of 1 Portland Cement, 3 Sand.

5	gravel	28 da.	....	1682	Dyckerhoff.
5	limestone	3 mo. 2 da.	8	4043	U. S. 1900, machine mixed.
5	limestone	3 mo. 2 da.	4	3187	U. S. 1900, hand mixed.
6	trap	8 da.	2	858	U. S. 1898.
6	trap	17 to 20 da.	3	1507	U. S. 1898.
6	trap	42 da.	3	2192	U. S. 1898.
6	trap	4 mo.	15	1648	U. S. 1898.
6	gravel	45 da.	....	1628	A. W. Dow.
6	gravel	3 mo.	....	2671	A. W. Dow.
6	gravel	6 mo.	....	1844	A. W. Dow.
6	gravel	1 year	....	2824	A. W. Dow.
6½	gravel	28 da.	....	1515	Dyckerhoff.
6	conglomerate	7 to 10 da.	23	1420	U. S. 1899.
6	conglomerate	1 mo.	28	2174	U. S. 1899.
6	conglomerate	3 mo.	30	2522	U. S. 1899.
6	conglomerate	6 mo.	23	3110	U. S. 1899.
6	cinder	29 da.	3	529	U. S. 1898.
6	cinder	91 da.	3	788	U. S. 1898.
6	brick	3 mo.	7	2207	U. S. 1899.
6	2 gravel, 4 broken stone	1 year	....	2835	A. W. Dow.
6	3 gravel, 3 broken stone	10 da.	....	949	A. W. Dow.
6	3 gravel, 3 broken stone	45 da.	...	1854	A. W. Dow.
6	3 gravel, 3 broken stone	6 mo.	....	2070	A. W. Dow.
6	3 gravel, 3 broken stone	1 year	....	2751	A. W. Dow.
6	limestone	?	10	3067	Baker.
6	limestone	7 da.	....	1584	125 % voids filled.
6	limestone	10 da.	1	908	A. W. Dow.
6	limestone	30 da.	....	1795	125 % voids filled.
6	limestone	45 da.	1	1791	A. W. Dow.
6	limestone	90 da.	....	2579	125 % voids filled.
6	limestone	3 mo.	1	2256	A. W. Dow.
6	limestone	6 mo.	1	2511	A. W. Dow.
6	limestone	1 year	3	2442	A. W. Dow.
7½	limestone	7 da.	1	1282	voids filled.
7½	limestone	30 da.	1	1672	voids filled.
7½	limestone	90 da.	1	1128	voids filled.
7.5 to 10.49	limestone	19 to 22 mo.	128	1872	G. W. Rafter.
10	limestone	7 da.	1	892	75 % voids filled.
10	limestone	30 da.	1	1472	75 % voids filled.
10	limestone	90 da.	1	919	75 % voids filled.

IV. Mortar of 1 Portland Cement, 4 Sand.

8	trap	4 mo.	10	1080	U. S. 1898.
5	gravel	28 da.	....	1273	Dyckerhoff.
8½	gravel	28 da.	....	1204	Dyckerhoff.
10 to 15	limestone	19 to 22 mo.	100	1735	G. W. Rafter.

V. Mortar of 1 Portland Cement, 5 Sand.

10	trap	4 mo.	12	708	U. S. 1898.
11.25 to 15.41	limestone	19 to 22 mo.	32	1554	G. W. Rafter.

VI. Mortar of 1 Portland Cement, 6 Sand.

12	trap	4 mo.	14	625	U. S. 1898.
12	conglomerate	7 to 10 da.	25	602	U. S. 1899.
12	conglomerate	1 mo.	30	993	U. S. 1899.
12	conglomerate	3 mo.	30	1078	U. S. 1899.
12	conglomerate	6 mo.	21	1408	U. S. 1899.
16.66	limestone	19 to 22 mo.	4	1427	G. W. Rafter.

ity in these times, but a few indications can be gathered.

For mortar 1 cement to 1 sand with the ordinary aggregates, using cinder concrete as the basis of comparison, trap concrete is 2.3 times as strong as cinder concrete and limestone concrete probably about twice as strong.

For mortar 1 cement to 2 sand, slag concrete seems to be about 3 times as strong as cinder concrete, limestone, brick and conglomerate concrete about twice as strong and trap concrete but 1.4 times. These comparisons are made using the results at 3 months' age, except that the limestone estimate is based on the extensive Rafter experiments.

Some of these results are rather surprising and will require further tests in corroboration. The strength of slag concrete at 3 months is confirmed by the result at 2 months. That of trap by the result for 4 months, that of conglomerate by those at 1 and 6 months.

For mortar 1 cement and 3 sand, using the results at 3 months, gravel and conglomerate concrete are each over three times as strong as cinder, brick and limestone more than 2.5 times and trap concrete about twice as strong.

For mortar 1 cement to 4 sand, the ages of the concretes differ too much for direct comparison, but the indications regarding relative strength of trap and limestone concrete are similar to those for the other mortars, that limestone concrete is definitely the stronger and that gravel concrete is also stronger than trap, though possibly not stronger than limestone concrete. These conclusions are borne out also by the results with 1 to 5 and 1 to 6 mortar.

In general, therefore, it may be stated that the indications of this table are that the strength of concrete of the various aggregates in more or less common use is approximately in the order gravel and slag, conglomerate, limestone, brick, trap and cinder. The results for slag and brick are so few in number that their position might be materially changed by further experiments.

Whether concretes in mass would arrange themselves in the same order is another question. The order is evidently not that of the strengths of the solid rock from which the concrete stone is made, and there is evidence that the adhesion of the cement to the stone is an important factor in the strength of cubes of the size of the test pieces.

VII. Crushing Strength of Stone Cubes.

Kind of Stone.	Dimensions.	Comp. Strength	Locality of Stone.
Limestone	4″ x 4″ x 4″	13,680	
		13,660	Carthage, Mo.
		15,320	
		17,130	
Granite.....	2″ x 2″ x 2″	31,782	
		32,635	Mt. Waldo quarries, Frankfort, Me.
		30,197	
		29,183	
	4¼ x 4½ x 3.2	21,035*	
Trap Rock	4″ x 4″ x 4″	33,304	
		19,444	Seamy.
Yammerthal Flint Limestone.	4″ x 4″ x 4″	28,951	Buffalo, N. Y.
		18,496	
Red Granite...	4″ x 4″ x 4″	28,647	

* Black Granite, from Maine.

VIII. Some Results by Cesare Zamboni, Alzano, Italy, with Gravel Aggregate.

Proportions.			Crushing Strength.		
Cement	Sand.	Gravel.	7 day.	28 day.	84 day.
1	3	6	1,721	2,219	2,802
1	5	10	1,024	1,294	1,593
1	9	18	284	370	445

Some results of crushing tests of stone cubes of small size are added to the list of tables to give some indication of the relative strength of some of the aggregates when in the form of solid rock.

A table of results of tests of gravel concretes, made by Cesare Zamboni at Alzano, Italy, is added as it gives some additional information upon the strength of gravel concrete. The concrete used was the highest grade of Portland cement made from natural rock by the Fratelli Pesenti at Alzano Maggiore.

BITUMINOUS MACADAM PAVEMENT IN WORCESTER, MASS.

The city of Worcester, Mass., has not heretofore been noted for the excellence of its pavements, but there has been some recent progress which gives promise that more attention will be paid to this important factor in a city's progress.

A new granite pavement has just been completed on Main-st. in the center of the city, and Warren's bituminous macadam waterproof pavement has been laid on School-st. and on S. Main-st. The need of the improvement in School-st. is shown by one of the illustrations accompanying this article and its companion shows the improvement made in the appearance of the street by laying the bituminous pavement.

This shows only one or two of the bene-

fits of the pavement but indicates some of the others. It is a very pleasant pavement to drive over, has a gritty surface, which affords a sure and safe foothold for horses and is easy of traction. The pavement is waterproof and, therefore, will not absorb the filth of the street.

The evidence derived from its use shows that it is easy to clean and to keep in repair, and thus far it has proven to be durable and not to crack or disintegrate.

Some of these points are better shown by other views, such as that of Hancock-st., Boston, past the Massachusetts state house, and Broad-st., Nashville, Tenn. The excellent condition of S. Main-st., in Worcester, after the bituminous macadam pavement was laid is shown in the view of that street near Grand, which includes the Piedmont church.

The last in the series of views shows the portable plant used by the Warren Brothers Company in heating and mixing the materials used in the pavement. The crushed stone used is very carefully assorted and mixed in varying sizes so as to form a mixture of the greatest possible density. If the local material is satisfactory a crusher and screens may be set up in connection with the mixing plant and the sizes of stone discharged from the screens fed in proper proportions to the mixers. If local stone is not available, the stone must be shipped in. The stone passes through a dryer on its way to the mixer where the various sizes are thoroughly mixed together and incorporated with the paving cement, and then dumped into carts to be delivered on the street. The operations of the mixer are automatic from the time the stone is delivered to the mixer until the combination is dumped into the cart.

The base of the pavement is of crushed stone, laid on the thoroughly rolled subgrade, and in turn rolled until it is fully compacted and the stone ceases to creep under the roller. On this base is poured a flexible bituminous cement as a binder of the bottom course to another course of a very tough bituminous cement. Upon this latter course is deposited the mixture from the plant, which upon being compacted and covered with a layer of trap rock screenings, also thoroughly rolled in, forms the wearing surface.

Daily samples of the materials and mixtures are sent to the laboratory of the company for careful analysis as to the proportions of the various sizes of stone and of the bituminous cement in the mixture.

The finished street looks like a macadam roadway. Under traffic it gradually assumes the appearance of an asphalt street, but retains the gritty surface which is one of the valuable features of the pavement.

SCHOOL STREET. WORCESTER, MASS.
Before Paving.

EDITORIAL COMMENT

Municipal Trading in England.
Government Construction of Roads.
Flow of Water in Streams.
Abolition of Grade Crossings.

MUNICIPAL TRADING IN ENGLAND.

Municipal ownership of public service industries is largely known in England as "municipal trading," an unfortunate and objectionable designation which has been made common, perhaps by the opponents of the system, and has arisen largely from the extension by a few cities of municipal operations to industries which might rightfully be designated as trading, and in which the city competes with private persons and corporations.

One of the points which is made by the opponents of municipal ownership of tramways, for example, is that the city competes with private companies and can drive them out of business because the city is under no absolute obligation to earn its charges, having the credit and the treasury of the city to fall back upon, while failure of a private concern to pay its expenses would result sooner or later in bankruptcy. If the "municipal trading" is limited strictly to public service industries in the nature of monopolies, which are such because the city must grant the right to operate them, this contention is of no effect.

It is true that proper operation of a municipal plant in one city will show advantages in the way of profits over fixed charges or of cost to patrons over the plant in another city owned by a company which must pay interest on a capitalization greatly in excess of the amount invested in the plant. This is not competition in any proper sense of the term. The result simply shows the defects of the present system of granting franchises. The result of the proper operation of a single municipal plant demonstrates beyond question the value of the franchise granting the operation of such a plant to a company, and thus shows, not the inability of the company to compete with the municipal plant, but the amount of its profits, computed on the basis of the legitimate investment, and the consequent value of the franchise to such a company. It is certainly self-evident that most of this value belongs to the municipality, being predicated upon the grant of the power to operate it and upon the growth of the city, and only a small percentage, if any, depending upon exceptional business ability in the officers of the company. The present system of letting franchises without retaining any control of their operation permits the concealment of this value through financial manipulations resulting in large bonded indebtedness upon which interest must be paid, and large issues of stock, much of which has no actual representation in the company's plant. The results of successful municipal operation are dangerous to the companies because they give some idea of the value of the franchises which have been given and demonstrate the justice of a proper control by the municipality of the financial operations of the companies to which it grants these franchises, if it does not think proper to assure their operation.

Most of the benefit of muncipal operation should come to the patrons of the industry in the form of lower rates for service. Most of the benefit of a proper municipal control of the operation of franchises should take the same form. Municipal operation of public service industries is much more common in England than in this country. That the benefit of such operation should not accrue to the general rate payer is apparently recognized quite generally by English cities. A table in a recent number of the Municipal Journal of London shows this quite clearly. Of seventy-six cities in the table sixty-four report profits from municipal trading and rents. Six of these report a reduction on rates of less than one penny in the pound, which is only a little over 1 per cent. of the average tax rate of about 7 shillings in the pound. Thirty-six are less than sixpence and but two are as much as 1 shilling. The maximum is 1 shilling 7 pence in a rate of 5 shillings 5 pence. All these towns and cities have over 20,000 population, and but ten have less than 40,000.

It is apparently true that the system of government of English cities secures better service from employes than that in vogue in the United States, but as the wasteful period in this new country passes, systems of greater efficiency will

SCHOOL STREET. WORCESTER, MASS.
After Paving with Bituminous Macadam.

be devised and the tendency is certainly toward closer supervision of some classes of public service industries and municipal ownership of others. While the reports from English cities are almost as conflicting as those from our own, on account of the bias of the collectors of statistics, there is much of value to be gathered from them, and there is an occasional unbiased source whose data can be depended upon. Thus far nearly all of the latter have authorized conclusions favorable to the municipal ownership of public service industries. Muncipal control of public service corporations on any reasonably complete scale has not yet been tested, however.

GOVERNMENT CONSTRUCTION OF ROADS.

A bill has been introduced in the House of Representatives of the United States providing for the establishment of a Bureau of Public Roads to take charge of the survey, planning and construction of good roads, outside the limits of cities and incorporated towns or villages, which may be petitioned for by the authorities in any political division of any state. It is proposed to appropriate $75,000 for the maintenance of the office and $20,000,000 for the construction of the roads. The limitations are that the national government shall pay one-half the cost of a road and the locality the other half, this half being divided between state, political subdivision (county or township) and property owners in any manner determined by them, and that no state shall receive more of the sum appropriated than the proportion which its population bears to the entire population of the United States.

Twenty-two officials and employes are provided for, the director to receive $4,500 a year and others from $2,500 to $720 a year, and "such other officers, agents and servants as the director may from time to time require." The $75,000 appropriated in one section would scarcely provide for these twenty-two men and the expenses enumerated, and would fail completely to provide for a force sufficient to plan the work and supervise the expenditure of the $20,000,000. Fortunately the section appropriating the latter sum for "co-operation and actual construction" includes "the maintenance of said Bureau of Public Roads."

The government has in the past constructed public roads, but they were highways to carry the traffic between sections of the country without other means of communication, approaches to government reservations or of similar public use. The excuse for the improvement of rivers and harbors has always been the service or the development of national commerce, however far the actual practice may have deviated from this ideal. This bill, however, goes to the farthest limit and leaves it to the judgment of the director of the bureau as to whether the road fund shall be used in developing communication by highways between states or distributed in improving sections of road entirely local in character, whether largely traveled or not. There are many who defend the principle of the river and harbor improvements who could not advocate such a bill "for the relief of the treasury of the United States" as this.

Were the principle of the bill to secure a majority vote the form of and the lack of safeguard on expenditure in this bill, would scarcely receive favorable consideration except in a legislature composed entirely of "practical" politicians. The Bureau of Public Roads, under this bill could readily be made the place for paying political debts and for distributing public patronage to the hungry. There have been state legislatures which would pass this sort of bill, but congress has never done so except in the river and harbor bill in its worst days, which was a gradual growth from a legitimate beginning.

FLOW OF WATER IN STREAMS.

The United States Geological Survey assumes a liberal definition of the term "geology" and is doing some valuable work in the study of the streams of the country, the results of which are of rapidly increasing value to engineers and those interested in the development of water supplies and water powers for various purposes and their preservation from depletion and from pollution. Some account has already been given in Municipal Engineering of the new work in the study of the pollution of streams, but the Survey has long been collecting data regarding the flow of streams, particularly in districts where the water can be used for irrigation, and is now extending this work to other parts of the country.

The Survey has recently studied some of the possible sources of water supply for the city of New York and the results of about a year's work will soon be ready for distribution.

The value of its studies, if carried far enough, will be indicated by the failures, as regards amount of water available in the Austin (Tex.) power plant, the Sweetwater and Bear valley irrigation projects and others constructed on insufficient data, which have not supplied all the water expected and some of which have

BITUMINOUS MACADAM PAVEMENT, HANCOCK STREET. BOSTON, MASS.

been completely abandoned. It is said that five engineers reported upon the probable yield of a certain New York stream and their estimates varied from 0.20 to 0.40 cubic foot per second per square mile, 100 per cent. of the lower amount, while the single year's measurements of the flow of the stream show a minimum not more than half the lowest estimate made.

The territory to be covered by the Survey is very large and the appropriations are comparatively small, so that full information for any given locality, unless very important, can scarcely be expected, even after many years, but the results for a single year, if well collected and presented, are often of incalculable value, though they must be taken with caution. Thus, one engineer may need to know the minimum flow of a stream, and the year of stream measurement may happen to be far above the minimum, while another, needing to know the maximum flow from a single stream, may likewise fail to find the information he needs. Still another needs to know both maxima and minima and their distribution through the year, and must be sure the year of measurement is not exceptional in any particular. These failures of information cannot be attributed to the Survey, but are strong arguments in favor of continuing and extending its work. The warning is simply against using the data for more than their value will warrant.

The temptation is great to distribute this kind of work over as many streams as possible, thus giving a little information about each, but no thorough study of any. Thus far the directors of the Geological Survey have not yielded very far in this direction and have shown good judgment in their selection of districts and the continuance of their work in them.

ABOLITION OF GRADE CROSSINGS

The effect of a constant pressure toward a reduction in the number of grade crossings is seen in Chicago and in Massachusetts. The Railroad Commission of the state of Massachusetts was established by the legislature in 1869 and has been a very powerful influence. It began work upon the elimination of grade crossings very soon after its creation and the effect of its work began to be felt in 1876. In a paper by E. K. Turner, before the Boston Society of Civil Engineers, in a recent number of the Journal of the Association of Engineering Societies, is a table showing the number of grade crossings of roads and railroads protected and unprotected by gates or flagmen, and the number of miles of railroad in the state for each year from 1873 to 1892. From this table it is seen that the number of grade crossings per mile of railroad increased from 1.34 in 1873 to 1.52 in 1876. The total number of grade crossings increased from 2,228 in 1873 to 2,776 in 1877. The total number of grade crossings was suddenly diminished to 2,245 in 1878 and has since fluctuated somewhat but finally was reduced to 2,001 in 1902. The number of grade crossings per mile of road has constantly diminished, reaching one per mile of road in 1898 and 0.95 per mile of road in 1902.

The percentage of protected grade crossings of the total number of crossings has constantly increased from 20 per cent. in 1875 to 56 per cent. in 1902. The number of fatal accidents at grade crossings has not been decreased notwithstanding the somewhat smaller number of them and the larger percentage which are protected. Thus the number of persons killed at grade crossings in 1874 was five, 1894 was nineteen, 1890 was twenty-four and in 1902 was twenty-five. There is, however, a reduction in the number of accidents in the last six or eight years from sixty-five, the maximum in 1894, to forty-four in 1902. The number of persons injured was likewise diminished from forty-six in 1894 to nineteen in 1902.

These facts suggest one or two subjects for consideration. The greater proportion of persons killed as well as the greater number may be due to the more rapid rate at which trains are run or to an increase in the number of crossings over well traveled roads by the construction of branch lines for surburban service. The decrease in the actual number of accidents indicates that the protection of crossings by gates and flagmen is having a good effect. The use of separated crossings may also have the effect of making persons more careful when they approach crossings on grade. Undoubtedly the proximity of a separated crossing will draw certain classes of traffic from the grade crossings in the vicinity.

Since 1890 crossings have been abolished on petition of railroads, cities and towns, the two corporations jointly, or the state, the railroad company or companies to pay 65 per cent. of the entire cost, the state and the city the remainder, the portion of the city or town not exceeding 10 per cent. Petitions have been presented in the proportion of fifty-nine by railroads, seventy-six by cities or towns and fifteen jointly.

In a larger state, less local in its character and less dominated by its largest city, some other distribution of the proportion of cost would doubtless be adopted.

BITUMINOUS MACADAM PAVEMENT, BROAD STREET. NASHVILLE, TENN.

The interurban railway problem is rapidly becoming an important one in this respect. So long as the roads were simply extensions of city lines running under somewhat similar conditions and locating their lines in the roadways or alongside, they were not considered as different in any degree from the city lines. The Massachusetts Railway Commission has recognized the danger of grade crossings of these lines and the steam railroads and has prevented them, except temporarily until the highway crossing could be separated. But the development of the high speed of limited electric cars or trains is putting the roads on which they run in the same class as the older roads as regards danger at crossings. In fact the electric car is often the more dangerous as it runs so much more quietly and its approach is thus less readily recognized. The lighter weight of cars, especially when run without trailers, makes it easier to stop them, thus offsetting the increase of danger to some extent.

This phase of the interurban traffic must soon receive serious attention in the most thickly populated districts. The difficulty of giving the electric line its full convenience of service and at the same time protecting the road crossings suggests another reason for making the combination of electric and steam roads, heretofore suggested by this magazine. The use of the electric lines to collect the local passengers will permit their operation at safe and convenient speeds. Through passengers can be delivered at fixed stopping points to the steam roads for carriage to more distant points. The necessity for separation of grades is then confined to the steam roads, which are relieved of the local stops and can make better time and do more business as a consequence. This plan would apply quite as well in case the through line were run by electricity.

THE QUESTION DEPARTMENT

CHARTER FOR SMALL CITY.

The city of Everett is contemplating increasing the charter from a city of the third class to one of the first class, which is permitted when the citizens are satisfied that we possess 20,000 people. I would like information in regard to an up-to-date charter. We would consider the increase in the veto power of the mayor, in fact, giving the mayor more responsibility, holding him responsible for the executive department of the city governed by commissions or boards, etc.

N. J. CRAIGUE, Councilman,
Everett, Wash.

A form of charter for cities of 5,000 to 23,000 population was presented to the legislature of the state of Indiana in 1901, which would conform to the requirements stated. It was favorably reported by a senate committee, but did not progress further at that session. It is based upon the forms of charter which have been in successful operation in the city of Indianapolis for about twelve years and in several other cities of the state in somewhat modified form for shorter periods.

The principle upon which the proposed charter is founded is that the municipality is not a political organization, but is a business proposition entirely. While it may be said that all forms of government are for the people, and perform the duties which the citizens cannot perform individually or which are better done for the people collectively, this is peculiarly true of the municipal form. The only questions of policy to be determined by the fundamental power, the people, are the rate at which improvements shall be made, the character of the laws regulating the departures from strict adherence to right and justice and of their enforcement. The administration of these policies, once determined, is a business proposition, pure and simple. The supply of water, light, sewers, transportation, streets, waste removal, public health and safety, all the operations of the city, are matters which are delegated to the city because they cannot be taken care of properly, if at all, by individuals. The municipality is, therefore, a great business corporation, which should be administered on the same principles as any other large business organization. The proprietors select from their own number, or elsewhere, a manager, and department

WARREN'S BITUMINOUS MACADAM PAVEMENT.

heads who are under his direction and control, selected by him or after consultation with him, and directly responsible to him. Subordinates are selected, retained and promoted according to their fitness. Everything is aimed at the certain and economical carrying out of the business policy determined upon by the proprietors.

This principle being admitted, the separation of the executive and legislative functions of the city follows. The general policy is decided by the proprietors, the voters, at the city election; some details of this policy must be outlined by their direct representatives, the city council; but the execution of the details of the work decided upon must be intrusted entirely to the manager and his subordinates, the mayor and his heads of departments. Many of the failures in city government arise from the meddling of the legislative branch with the executive branch of the municipality, thus scattering the responsibility among the members of a body upon which, though responsible, the consequences of error and neglect cannot be fastened. Most of the other failures arise from the election of heads of departments by the people, thus making them independent of the mayor, and making it possible to shift responsibility from one to another until it is lost sight of. In some instances the mayor is in no sense the manager, his powers being limited to a few show functions. The case is not bettered if the council elects the subordinate officers, indeed, this is often worse than direct election by the people.

The bill referred to has not been printed, except for the files of the Indiana State Senate. It contains 143 sections and covers all branches of the city's activities but the school system. The subjects treated in the sections are as follows, notes being made of special features:

1. Applies to cities of 5,000 and 23,000 population.

2, 3. Method of adoption by cities and towns.

4. Mayor, city clerk, police judge and councilmen elected.

5 to 8. Details of installation of system.

9, 10. Prohibited actions of officers.

11 to 42. Duties and procedure of council. Mayor has veto of ordinances, requiring two-third vote of council to override. Council fixes salaries, cannot establish new departments or elect officials or subordinates. Can levy taxes not to exceed $1.50 per $100; can borrow money not to exceed 2 per cent of assessed valuation; may issue bonds at not to exceed thirty years time and 6 per cent. interest.

43 to 46. Provisions for election of mayor and clerk and filling vacancies.

47. Mayor's duties. Fills all vacancies, appoints heads of departments subject to removal by himself, and not to confirmation by council. May veto special items in appropriation. Heads of departments form his "cabinet." Civil service may be adopted.

49. Duties of clerk. In cities less than 15,000 comptroller acts as clerk unless council provides for election of clerk.

50 to 54. General provisions for departments of finance (comptroller), law (attorney), public works and public safety (three members each), assessment and collection, public health and charities, and no others. Subordinates are employed and discharged by heads of departments. Estimates of funds needed made annually by heads of departments, revised by comptroller, transmitted with recommendations by mayor to council, who can diminish but not increase. Additional appropriations during year on recommendation of comptroller and two-thirds vote of council.

55 and 56. Duties of comptroller. Close scrutiny of bills and accounts required of him.

57. Duties of city attorney.

58 to 83. Duties of board of public works. City engineer appointed by mayor and subject to board of public works. Board makes contracts and grants franchises subject to approval by council. May let city work by contract or do under its own supervision. Streets, sewers and sidewalks may be improved on petition of property-owners, who pay the cost. Board may initiate improvements under similar procedure, giving time for remonstrance, one of half the property-owners resident on the street requiring a two-third vote of the council to override, and one of two-thirds nullifying the improvement resolution entirely. Cost of improvements estimated per front foot, except part of main sewer, which is assessed over entire district affected in proportion to benefits. Council may issue bonds for improvement bearing its name and a lien on the property benefited, payable in ten equal annual installments.

85 to 98. Duties of board of public safety. In cities of less than 15,000 duties devolve on board of public works unless council provides for the separate board. Has charge of fire and police departments. Employes may be removed for any reason, written and filed, except politics. No electioneering by employes permitted.

99 to 121. Assessment and collection of taxes and special improvement assessments in charge of county auditor and treasurer. Duties set forth in full.

BITUMINOUS MACADAM PAVEMENT, SOUTH MAIN STREET. WORCESTER, MASS.

122 to 124. Duties of board of health and charities.

125 to 141. Duties of police judge, clerk and bailiff. Prosecuting attorney of the judicial circuit also acts in city court. In cities of less than 15,000 mayor is police judge, except as provided by council.

142. Fixes salaries and provides that they may be increased 50 per cent. by vote of council, except boards of public works and public safety, which may be increased 75 per cent.

143. Population to be taken from last U. S. census.

The success of this general form of charter in the larger cities of Indiana warrants the belief that with the modifications incorporated above and others found desirable by experience it will be equally successful in the smaller cities. The only fear is that the system will be more expensive, but, the consolidations permitted, and the concentration of responsibility will keep expenses down and save enough on former careless methods to pay more than the increase in administrative expenses.

The "Municipal Program" adopted by the National Municipal League follows the same principles as the above form of charter in a more general way, giving a little more power to the council, but giving the mayor his full due of authority and responsibility. The principles of the "Program" are discussed in a pamphlet with that title, No. 7 of the League.

Fairlie's "Municipal Administration" ($3) gives a chapter to the "Program." The book traces the history of municipal administration in civilized countries and shows the development of various ideas of city government, their failures and successes and the present tendencies. Its study in this connection will prove to be worth while.

"The Municipal Code" ($1) gives the act for the government of cities passed by the General Assembly of the state of Ohio, October 22, 1902. It violates nearly every principle on which the above code is founded. It reduces the powers of the mayor to a very short list beyond the necessary administrative functions. All the heads of departments and boards are elected, except the boards of public safety and health, which are appointed by the mayor and confirmed by the council, the former requiring a two-thirds vote, and in case this fails the governor of the state appoints. The opinion generally expressed in the state of Ohio is that the code is not theoretically correct and will not reform the abuses heretofore existing.

The proceedings of the seventh annual convention of the American Society of Municipal Improvements ($1), contains a paper on "City Government" by F. W. Cappelen, devoting over 130 pages to an abstract of the provisions of charters and municipal government acts in all parts of the world. The charters of San Francisco, Seattle, Indianapolis, Milwaukee, New Orleans, St. Louis, Minneapolis and New York are considered; also the "Municipal Program" and the laws governing German cities, Vienna, Zurich, Sidney, New Zealand cities, Calcutta, Shanghai and Canadian cities.

The referendum on certain questions is a valuable feature of the San Francisco charter, in addition to that provided by the constitution of the state of California insuring the principle of home rule of cities. This provision is described in Municipal Engineering, vol. xvi, p. 316, and provides that changes in city charters may be made only on ratification by an affirmative vote of three-fifths the voters at an election at which the amendment is presented, and approved by the legislature. The Minnesota constitution also has a provision authorizing cities to form their own charters.

POLICE STATION PLANS.

Can you inform me of any up-to-date publication covering police station, lock-up and justice's court construction? Our city is about to construct one and wants it to be up-to-date. W. E. D.,——, N. J.

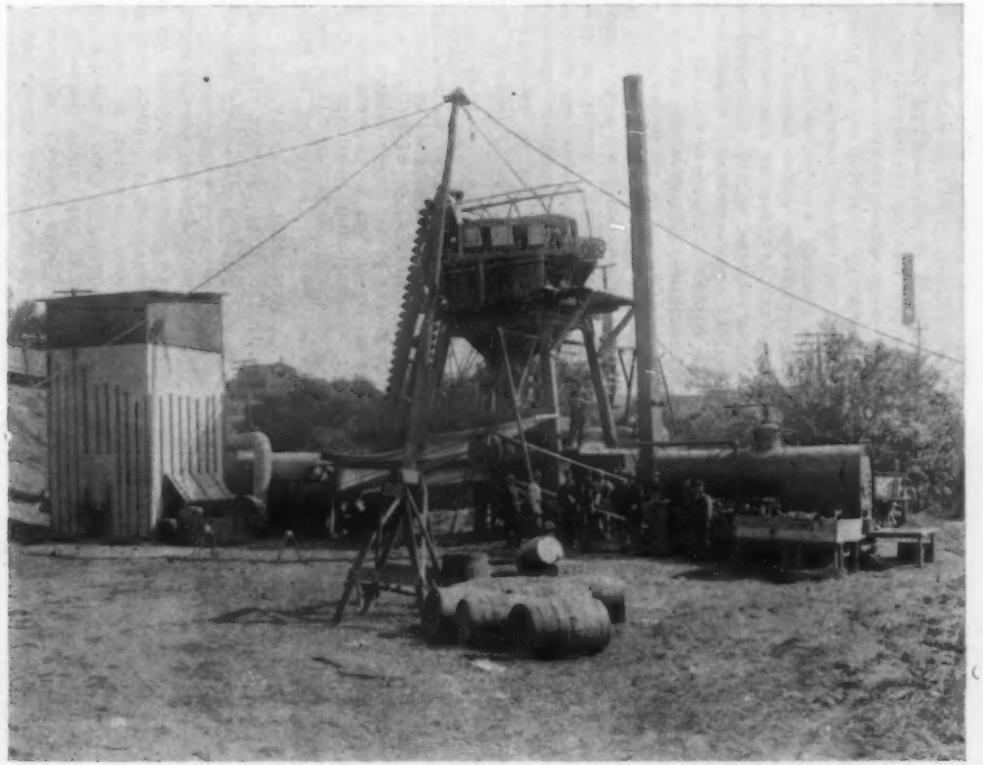
This question was answered in part in vol. xxii, p. 235, referring for details to the first report of the engineer department under the military governor of Cuba and to Palliser's "Court Houses, Village, Town and City Halls, Jails, etc." ($2). Reference was also made to the steel-concrete construction of such buildings. The makers of cell work can doubtless give much information, such as Dieboid Safe and Lock Company, 79 Duane-st.; Hall's Safe Company, 393 Broadway; Herring-Hall-Marvin Company, 400 Broadway, New York City; William F. Remppis & Co., Reading, Pa.; Snead & Co., foot of Pine-st., Jersey City, N. J. The city of Indianapolis has recently constructed a handsome and convenient structure for the uses named only which is well worth inspection.

A CEMENT ROCK DEPOSIT.

Will rock with the following analysis make a good grade of cement and for what purpose could it be used? Would it make Portland cement? Analysis: Silica, 13.66; oxide of iron, 4.14; carbonate of lime, 54.19; magnesia, 28.01; total, 100.00.

H. G. E., ——, Tenn.

This analysis is similar to that of some of the rock from which natural hydraulic cements on the market are made, and a fair grade of that class of cement might



MIXING PLANT FOR WARREN'S BITUMINOUS MACADAM PAVEMENT.

be manufactured if the rock is uniform in composition. The ingredients are not such as make Portland cement. The question can be most definitely answered by a cement chemist and engineer who has had an opportunity to examine the property and thoroughly test the quality and uniformity of the deposits and study the possibility of modifications of the composition of the resulting cement.

Reference may be made to the business directory in our advertising pages under the headings "Cement Plant Designers" and "Chemical Tests" and to the department of cement tests and analyses in the "Directory of American Cement Industries and Handbook for Cement Users" ($5) for names of persons who make a business of such investigations.

HOW TO PROCURE COPIES OF THE ADOPTED FORMS FOR MUNICIPAL ANNUAL REPORTS.

Please let me know the cost of the volume of proceedings of the American Society of Municipal Improvements for 1902; also the cost of the forms of reports of annual operations of paving and sewers, if these should be printed separately as suggested by Municipal Engineering on page 388 of November, 1902. W. E. SMALLFIELD, Mayor.
Renfrew, Canada.

The proceedings of the conventions of the American Society of Municipal Improvements are published under the direction of the secretary of the society, George W. Tillson, Municipal building, Brooklyn, N. Y., and the cost of the annual volumes is $1 each. The volume for 1902 is not yet issued.

Municipal Engineering reprinted the forms for water works, paving and sewers and a few copies are still in existence which will be supplied on application as long as they last. The form of water works report is superseded in part by that of the New England Water Works Association, which can be procured on application to C. W. Sherman, 715 Tremont temple, Boston, Mass. The additions cannot yet be procured. Arrangements will doubtless be made to reprint the forms of report from the proceedings of the A. S. M. I. when they are ready. Until that time the full set cannot be obtained.

INFORMATION ABOUT MANUFACTURE OF SLAG CEMENT.

Please refer me to sources of information about the manufacture of cement from slag. H. T., ——, Ala.

The "Directory of American Cement Industries and Handbook for Cement Users" ($5) is the best book from which to obtain a comprehensive view of the manufacture of cement from slag. Reference may be made to descriptions of processes in use which will be found in that book in the descriptions of five factories. Mr. E. C. Eckel gives a general statement of the methods of making puzzolan and descriptions of the works in Alabama making such cements, in a report of the United States Geological Survey. There are no detailed studies of the methods of making such cements in the English language. "The Rotary Kiln" ($2) by B. B. Lathbury gives some illustrations of a plant for making Portland cement from slag and some idea of the process.

RELATIVE MERITS OF WET AND DRY CONCRETE.

In preparing the answer to the question regarding the relative merits of wet and dry concrete, given on page 451, December, 1902, vol. xxiii, the extensive experiments made by George W. Rafter for the state of New York were inadvertently omitted from the consideration. Mr. Rafter's experiments were made for the purposes stated in the article in this number on the "Strength of Concrete With Various Aggregates," and if his results are collected with reference to the condition of the concrete with respect to the amount of water used they are directly applicable to the answer of the question here under consideration. The experiments were made upon twelve-inch cubes of limestone concrete, using five different brands of Portland cement manufactured in New York, one being a silica Portland.

The blocks made to represent "dry" concrete were, "generally speaking, only a little more moist than damp earth. Such blocks required a large amount of ramming in order to flush the water to the surface. In the 'plastic' blocks the mortar was made of the ordinary consistency used by the average mason. A moderate amount of ramming brought the water to the surface in these blocks. In the 'excess' blocks the water was so far in excess that the concrete quaked like liver under moderate ramming."

The proportion of cement to sand was 1 to 2 and 1 to 3, the results being the means of equal numbers of these two qualities of mortar. The proportions of mortar to stone were 33 and 40 per cent., very nearly equal numbers of blocks of each proportion being used.

The resulting average compressive strength of 156 blocks of "dry" concrete was 2,470 pounds per square inch, of 144 blocks of "plastic" concrete 2,294 pounds, and of 148 blocks of excess concrete was 2,180 pounds. Nearly all the individual results show a similar range of values which is sufficiently pronounced to war-

rant a definite statement in accordance with the figures given.

The age of the blocks when tested was more than eighteen months and less than twenty-four. The crushing tests were made at the United States arsenal at Watertown, Mass. Mr. Rafter emphasizes the fact that the dry concrete blocks must be sprinkled or kept moist until fully hardened in order to develop their full strength.

HOW TO REPLACE CEMENT FLOOR SURFACE—RETARDERS OF CEMENT SETTING.

A large power house has a cement floor which sweeps up, making a cloud of dust which is bad for the machinery. Can you give me any information in regard to making a finish on this floor which will be hard and will not sweep up? There is only a half-inch to work on. What materials and proportions would be best?

Are there any chemicals which can be used to hold cement back from setting too fast, as quite often I would like to be able to finish work the next morning?

G. B. WRIGHT, Ashtabula, O.

It is always dangerous to guarantee the permanency of a wearing surface put on a base which has already set, and in this case there is the additional difficulty arising from the failure of the particles of the concrete in the base to cohere. A wearing surface may adhere to an old base, but is not certain to do so, and is quite likely to fail in some parts of a large floor, even if it is satisfactorily attached over part of the area. The effect of the dust spoken of will be to prevent the adhesion of the new material wherever it intervenes.

It may be worth while to make the attempe to put on the new surface, and if it is laid in blocks the failure of a part will not affect the surrounding parts which have adhered successfully. Perhaps a small part of the new cover can be laid first and if it proves successful the rest can be put on. If it is not successful the only cure is the taking up of the old floor and the laying of an entire new one. The mixture should probably be one part of first-class Portland cement to one and one-half of clean sharp sand, crushed quartz or finely broken granite, and enough water should be used so that tamping will not be necessary. In the dry air of the power house it will be necessary to keep the surface moist for several days by frequent sprinkling or covering with burlaps kept damp. If this is not done the dust nuisance may again develop. The surface of the old floor should be scored in channels to give additional opportunity for adhesion. Every particle of dust should be swept and washed off of the surface and out of the channels or grooves, and the old walk should be thoroughly wet up to the time of putting on the new top. Cut the new top into blocks of rather small size, say twenty square feet or less, making the joints as thin as possible, unless the floor is subject to considerable variations in temperature, in which case they should be larger and filled with some material which will permit the blocks to expand and contract individually. Some of our correspondents report success in putting on new tops to floors or walks, but there are many failures and success cannot be guaranteed.

There are one or two chemicals which are used to retard the set of cement and which are introduced sometimes before the cement clinker is ground at the factory, so as to insure perfect mixture. One of these is gypsum in small quantities. A chemical which would retard the setting of cement over night without injuring its strength and durability is hardly possible. The only safe method is to finish work the same half day that it is begun. Frequenly a delay over the noon hour causes a failure in fine work.

PREPARATION OF SUB-GRADE FOR PAVEMENT.

We desire to construct a permanent road bed on our main street for granite blocks, asphalt or bituminous macadam and should like information in regard to the proper preparation of the sub-grade; also in regard to the best position in the street for gas pipes, the main sewer now being in the center of the street.

STREET COMMISSIONERS,
Barre, Vt.

The essentials in the sub-grade of a pavement are good drainage and solidity. The latter can almost always be readily obtained if the former is assured. The method of obtaining good drainage depends entirely upon the character of the soil. If the sub-soil is porous and the sub-soil water can run away as rapidly as it comes, no special drainage facilities are necessary. Often, however, a sub-soil drain is necessary on the upper side of the street, usually taking the form of a common or vitrified tile pipe line with open joints, varying in diameter from three to six inches or more according to the length to the outlet and quantity of water to be disposed of. Occasionally in a cut or a valley drains on both sides of the street are necessary. This may be the case also on a level street underlaid by a stratum in which water stands.

If the sub-soil is such that no drainage is deemed necessary the excavation for the street should be made nearly to the sub-grade and the area should then be rolled with a road roller. A steam roller is usually best, the weight depending on the character of the soil and being from

seven to ten tons. The bed should be rolled repeatedly until it is solidified to the fullest extent possible. Occasionally pockets of loose and soft material may develop under the rolling. When they do, the soft material should be removed and replaced by good gravel or broken stone, not too coarse, or with the best of dry, clean earth, which will compact well under the roller. If the lines of drain tile are laid within the area of the pavement special care must be taken to tamp and roll the filling of the trench in which the pipes have been laid. These lines are safer if laid outside the curb.

The location of gas and water pipes and conduits is ordinarily the result of the balancing of conditions. The ideal method in a residence street, so far as the pavement is concerned, is to make the paved portion narrow enough so that a line of each pipe can be laid on each side of the street in the lawn between the curb and the paved sidewalk. The expense of the duplication of pipes and the presence of trees often prevent the adoption of this plan. The most common arrangement is to place the sewer in the center, as the deepest, the water pipe on one side of the street, say six to ten feet from the curb, and the gas pipe on the other side. The pipe of each system should always be laid on its own side of the street and never on the other, and as nearly as possible at the same distance from the curb or from the property line, so that there may be as little confusion in the records as possible. When it is necessary to put these pipe lines within the area of the pavement they should be laid the season before the pavement is laid, if possible, and in any case the trenches must be filled and tamped in the best manner to compact the material used as filling and any defects which show up under the roller must be corrected, preferably by filling the depressions which show themselves with broken stone or gravel, thoroughly rolled until the resulting surface of the sub-grade is smooth and uniformly conformed to the requirements of the plan for the street. These trenches and the cross-trenches for the house connections are the weak spots in the sub-grade and require thorough work if trouble with the finished pavement on their account is to be avoided.

Articles upon the subjects included in the questions will be found in many numbers of Municipal Engineering. Reference may be made, among others, to the following: Vol. xxi, p. 308 on "Pavements and Underground Improvements;" p. 366, on "Foundation of Street Paving;" xvii, p. 1, on "Construction of Substructures in Streets;" xviii, p. 180, on "Construction of Brick Pavements;" xx, p. 219, on "Modern Brick Pavement Construction;" xxiii, pp. 374 and 383, on "Methods of Highway Construction."

ORNAMENTAL BOULEVARDS IN THE UNITED STATES.

I have been making inquiries of some other cities as to their boulevards, avenues (in the European sense), promenades and driveways. The information I asked for in particular was the construction of the roadbed (foundation, character of paving material, etc.), cost of construction and maintenance, dimensions lengthwise and crosswise, adornments in the way of trees, flowers, fountains, statuary, etc., also if I could get drawings or other pictures showing cross sections and perspective views. The returns have been very unsatisfactory and I am beginning to believe that higher grade streets and thoroughfares are still a thing in name only in this country.

Should you have dealt with this subject in any of your previous numbers, kindly let me know.

HENRY LAESSIG,
City Topographical Survey,
Baltimore, Md.

The ornamental boulevard is truly but a name in this country, the only example having any claim to the title being a few parkways like those of Boston and a few of those in Chicago. The park system of Boston is described in an article running through three numbers of Municipal Engineering, vol. ix, pp. 267, 341 (Nov. '95 and Dec. '95), and vol. x, p. 15 (Jan. '96) and a general statement regarding the parkways and boulevards in the system is given. The Sheridan drive along the lake shore north of Chicago is described in vol. ix, p. 143, (Sept. '95). A description of a subway on a Detroit boulevard, in vol. xi, p. 380, (Dec. '96) suggests that a system of ornamental driveways is developing in that city. The annual reports of the Essex County Park Commission of Newark, N. J., give some details of the plans and methods of construction of parkways, a system of which has been partly designed and constructed. Some illustrations of the parks and roadways are given in vol. xx, p. 12 (Jan. 1901) and 134 (March 1901). The handsome reports of the park commission of Wilmington, Del., may also give some of the information desired. In vol. xvi, p. 366 (Jan. '99) will be found some statement of the work that has been done on the plan. An article on tree planting in the streets of Washington will be found in vol. xv, p. 287 (Nov. '98), and a suggestion regarding beautifying streets by proper designs for street fountains in vol. xviii, p. 204 (March 1900). Some cross sections of foreign

boulevards will be found in vol. xii, p. 139, (March '97). A common type of boulevard construction in American cities is shown in vol. xxii, p. 25, (April 1902), and again in vol. xxiii, p. 10 (July 1902), these being pictures of streets in small cities.

Many cities, large and small, have indefinite plans for park and boulevard systems which have not yet been developed for lack of time and money. A few have begun the process of procuring the necessary land and beginning construction, and a very few have built small sections of boulevards and parkways. Some of these, as Chicago and Indianapolis, have put first-class macadam or other paving upon a few streets and termed them boulevards, though nothing has been done to make them ornamental driveways, except to give them this improved pavement. Others like Omaha have large plans which have been laid out on the ground with, perhaps, some grading and such additional improvement as property-owners on local sections have succeeded in procuring, but their development is only in the early stages.

Many others might be mentioned, but the plans are too indefinite or the amount of construction possible under the financial conditions of the cities is so small that they are scarcely worthy of attention, except as indicating what the desires of the cities are in the direction of beautifying their pleasure grounds and drives. Very few American cities have yet attained the wealth and leisure necessary to permit a development apparently so far removed from commercial return, but these cities are finding that the money is well invested.

HOW TO LAY BRICK PAVEMENTS.

There seems to be some difference of opinion as to some details of the method of laying brick pavements, such as the method of compacting the cement foundation, grout filling for the brick surface, expansion joint, weight of roller for rolling brick surface. What is the most approved practice reported in Municipal Engineering? W. P. —, Ind.

An examination of the articles and answers to questions in Municipal Engineering will show that there is very little variation in the recommendation of engineers, so far as the items mentioned are concerned, from the method of laying brick pavements given in Geo. R. Grimes's article on "Construction of Brick Pavements," which is printed in vol. xviii, p. 180, and which has been embodied with scarcely any change in the recommendations of the committee on brick paving of the National Brick Makers' Association, which are printed in vol. xxii, p. 251. Both these articles go into great detail regarding every operation of laying a brick pavement, and the sentences in the latter regarding the items mentioned are as follows:

"For the reception of this mixture (concrete of 1 natural or Portland cement, 2 or 3 sand and 4 or 5 broken stone or gravel mixed as directed) the grade should be staked off in 5-foot squares with a stake at each corner. Tops of each should be at the surface of concrete, which must be tamped until free mortar appears at the surface. Occasional sprinkling in extreme hot, dry weather is beneficial."

"Tamping and Rolling (of brick)—After the inspection is thus completed the edge of the pavement shall be tamped to grade next to the curb, to a width of 6 or 8 inches out from the curb with a hand tamper. The entire pavement shall then be rolled with a 5-ton steam roller until all brick are thoroughly bedded and the whole surface assumes a practical plane.

"Expansion Cushion—An expansion cushion must be provided for, one inch in thickness, next the curb, filled 2-3 its depth with pitch, the top 1-3 being filled with sand, and a like cushion at right angles with the street at intervals of 50 feet.

"The Filler—The filler shall be composed of one part each of clean, sharp sand and Portland cement. The sand should be dry. The mixture, not exceeding one-third bushel of sand, together with a like amount of cement, shall be placed in the box and mixed dry, until the mass assumes an even and unbroken shade. Then water shall be added, forming a liquid mixture of the consistency of cream. From the time the water is applied until the last drop is removed and floated into the joints of the brick pavement the same must be kept in constant motion. The mixture shall be removed from the box to the street surface with a scoop shovel, all the while being stirred in the box as the same is being thus emptied. The box for this purpose shall be 3½ to 4 feet long, 27 to 30 inches wide, and 14 inches deep, resting on legs of different lengths, so that the mixture will readily float to the lower corner of the box, which should be from 8 to 10 inches above the pavement. This mixture, from the moment it touches the brick, shall be thoroughly swept into all the joints. Two such boxes shall be provided in case the street is 20 feet or less in width, exceeding 20 feet in width three boxes should be used. The work of filling should be thus carried forward in line until an advance of from 15 to 20 yards has been made, when the same force and appliances shall be turned back and cover the

same space again in like manner, except that the mixture for the second coating may be slightly thicker than the first. To avoid a possibility of any great thickening at any point there should be a man with a large sprinkling can, the head perforated with small holes, sprinkling gently the surface ahead of the sweeper. This should be done in the application of each course here specified.

"After the joints are thus filled flush with the top of the bricks and sufficient time for evaporation has taken place, so that the coating of sand will not absorb any of the mixture, one-half inch of sand shall be spread over the whole surface, and in case the work is subjected to a hot summer sun, an occasional sprinkling, sufficient to dampen the sand, should be followed for two or three days.

"The grouting thus finished must remain absolutely free from disturbance of traffic of any kind for a period of ten days."

The details of the remaining steps in the construction of a brick pavement will be found on the pages noted. These articles are particularly valuable to those having little experience because they are so fully detailed. If they are not at hand reference may be made to other articles giving the practice of other engineers and contractors, nearly all of which agree in principle with the methods here given, though there may be some differences in detail of manipulation.

The Indianapolis specifications for the brick surface are given in vol. x, p. 249.

Ernest Adam discusses the expansion joint in vol. xi, p. 308, and xiii, p. 275.

E. A. Kemmler gives some discussion of the principles of brick pavement construction in vol. xiv, p. 80, and xix, p. 187.

W. H. Tarrant has an excellent article on "Modern Brick Pavement Construction" in vol. xx, p. 219, in which he follows very closely Mr. Grimes's method, stating it in less detail.

The question department has considered the subjects of fillers, expansion and the general plan of paving specifications in vol. xi, pp. 158, 361; xiv, p. 273; xviii, p. 370; xix, p. 273; xxi, pp. 78, 81.

While necessarily less detailed than the N. B. M. A. specifications referred to, all these articles show that their authors have reached very nearly the same conclusions and that there is a substantial agreement, although some are not so careful to require a smooth surface to the concrete, some would use a sand filler or a tar and asphalt filler under some conditions, but all consider the grout filler the best, and some, like Mr. Grimes, believe that for brick pavements laid in hot weather the expansion joints are less essential than when they are laid late in the season. The writer has never seen a brick pavement which was well laid in hot weather which seemed to require an expansion joint.

DEDUCTIONS FROM PRICE OF PAVING FOR AREAS UNPAVED.

What is the custom in measuring up pavements in alleys? Are the areas deducted from the number of square yards in the alleys, or are they thrown in? What is the law on the subject where nothing is said in the specifications about stairways, areas, etc? X. Kokomo, Ind.

In Indiana the bids are received per linear foot of each side of the alley and the city engineer's estimate shows the number of square yards of brick paving to be done. If nothing is said regarding leaving unpaved areas, it is probable that he has not deducted them from the total area of the alley as derived from its length and width so that the contractor has made his bid on a larger amount of work than will actually be done. Whether he can collect for the entire area, whether paved or not, is a question which the court would doubtless decide largely from the circumstances in the particular case. If the contractor loses nothing but the profits on the few feet of brick less than the contract calls for, the case should not be difficult to settle, but if he has made his bid on the actual net area to be laid it would hardly be fair to deduct the unpaved areas again, and the court would probably consider this favorably to the contractor. There does not seem to be any law applying directly to the subject so that the equity of the particular case should govern.

From the property-owner's point of view the area, if properly omitted, is so much saving to him, which he has good ground for claiming, especially under a gross bid from the contractor, but if he is a trespasser upon the alley, having no legal authority for occupying the area so that it cannot be paved, his case is not so good, especially in case the contractor has bid on the net area.

In one case the contract for paving an alley was let on the basis of the platted width, at a price per linear foot of each side of the street. Some property owners objected to the payment of the full amount because, adjacent to their lots, the brick pavement was not the width stated in the contract. The contractor expressed his readiness to make the pavement the full width if the property owners would permit it, their fences and buildings encroaching upon the alley. The difficulties in the way of a proper placing of the lots, as well as of moving

buildings, caused the property-owners to refuse permission and the contractor finally agreed to some reduction, but not the equivalent of the area not paved, although a suit might easily have resulted in an award to him of the full amount. If stairways, refuse pits, etc., are encroachments on the alley, even with permission from the city authorities, the same condition results.

In a sidewalk case the contract was let at a fixed price per linear foot with the proviso that walks already laid would be permitted to remain. This resulted in a deduction from the assessment for the walk in front of a lot of the price of any area not paved by the contractor, at the rate per square foot computed from the contract price and the contract width of walks, whether this unpaved portion was old walks, stairway or other area.

Other cases of similar nature might be cited showing that the procedure in any given case is governed by the principles of equity in the case.

HOW TO LAY SEWER PIPE.

Have you a book with instructions for laying sewer pipe?

E. M. GUARD, Supt. Water Works,
Charlevoix, Mich.

Folwell's "Sewerage" ($3) has the best description of the methods of laying sewers which has been published. It includes all the ordinary details of all parts of the processes of laying brick and pipe sewers and some of the solutions of special difficulties which arise.

MANUFACTURER OF PIPE CALKING MACHINE.

Will you kindly inform me who are the manufacturers of the O'Neill calking machine?

C. G. BRANDON,
Yellowstone Park, Wyo.

The A. P. Smith Mfg. Co. of Newark, N. J., make the O'Neill automatic pipe-jointing machine for calking pipe joints of cast iron or other pipe with similar joints.

COST OF EXCAVATING SEWER TRENCHES.

I wish to know what you have published as to the cost of excavating different strata for different depths of sewer trench; also of casing the same.

N. B. RIDGE, Sterling, Ill.

A table giving the cost of excavating sewer trenches in earth requiring no sheeting and using no machinery is given in vol. xviii, p. 111. It includes sewers from 8 to 24 inches in diameter and trenches 6, 8, 10, 12, 14 and 16 feet deep. The sheeting adds 25 to 100 per cent. to the cost of the excavation, depending upon the amount necessary to support the sides of the trench. In vol. xxi, p. 403 will be found some figures on cost of excavating sewer trenches in solid rock. On page 407 of the same volume is a diagram giving the cost of excavating trenches for sewers from 8 to 36 inches in diameter and 3 to 26 feet deep, in material ranging from ordinary loam to stiff clay, but little timbering being required in cuts of less than 10 feet, no machinery. Some figures for rock excavation will be found on page 408, and for sheet piling on page 409.

A PUMP FOR IRRIGATION PURPOSES

Mr. F. E. Hayden of Granite, Col., whose question regarding the cost of wooden pipe lines for irrigation purposes was answered in the October number of Municipal Engineering, observed the paragraph regarding the Foster Impact Engine in the same number and suggests the application of the engine to his purposes. There is plenty of water in the Grand river from which a supply can be drawn for irrigating the adjacent lands during the dry season and there is plenty of fall from which power can be developed.

From the fact that the Foster Impact Engine requires no fuel or other power than the fall of water, it is well adapted to irrigation purposes under the conditions named and the additional fact that the amount of attention which the pump require is almost nothing adds to the economy of its use and may make possible irrigation of lands which could not pay the expense of other methods of applying water to them.

REDUCTION OF WATER RAM.

We have a half-inch galvanized water pipe supplying water to the second story which thumps so loud when the pumps are running that it awakens the occupants of the house. We pump into standpipe. What will prevent the noise?

J. H. BRIDGES, Supt. Water Co.,
Henderson, N. C.

The circumstances are not sufficiently stated to make the answer definite. The use of an air chamber on the supply pipe to a hydraulic elevator is considered in vol. xxi, p. 401, of Municipal Engineering. The reduction of water ram in a pipe from which a boiler feed pump draws water was discussed in vol. xxii, p. 95. The water ram in the present case, as in the other two, is due to insufficient cushioning of the stroke of the pumps.

If the pipe in question is at the pumping station, the noise is an indication that the air chambers on the pump are too small or that they have been permitted to fill with water until the air cushion is too small to do its work properly. In the latter case air can be pumped into the air chamber or a check valve can be ar-

ranged so that, when in action, a small amount of air can be drawn in with each stroke of the piston, the admission being under the control of the engineer. It might be possible to reduce the noise by relaying the pipe without rectangular bends, but it is evidence of objectionable strain on the water pipe system and is a good indicator, whose warning should be heeded.

MUNICIPAL MATTERS IN COURT

Front Foot Rule—Free Water Clause—Riparian Lands—Lighting Contract—Exception to Debt Limit.

Abstracts from Decisions of the Higher Courts.

Prepared by Andrews & Murdoch.

Certificate of Engineer—Where a contract does not make the certificate of the engineer or superintendent of works conclusive as to the performance of the work in a workmanlike manner, nor as to the fact that the materials used were according to the contract, but only makes the obtaining of such certificate one of the things which the contractor must do to secure his payments, the fact that such certificate has been obtained by the contractor is no bar to an action for damages founded upon alleged breaches of the condition of a bond to indemnify a city against bad or defective workmanship done or materials furnished under the contract. Mayor, etc., of City of Newark vs. New Jersey Asphalt Co. et al., 53 At. Rep. (N. J.), 294.

Cleaning Streets Between Railway Tracks—A city ordinance required a street railway company to clean between its rails all streets occupied by the company, and imposed a penalty for violation of the ordinance. On a prosecution for violation of the ordinance it appeared that, owing to the presence of the tracks, the street, instead of sloping from the center, had a flat crown sixteen feet in width, and that the rails retained the dirt in the center of the street, and that, owing to such conditions, it was more difficult and expensive to clean the street. Held, That the ordinance was not void as casting a public burden on the street railway company. City of Chicago vs. Chicago Union Traction company, 65 N. E. Rep. (Ill.) 243.

Dealing With Municipality—A person dealing with a municipal corporation is held to know the extent of the power of such corporation, and if he obtains a grant for which there is no legal authority, or it is in violation of an express statute, he obtains no right which is enforceable in the courts. Cedar Rapids Water Co. vs. City of Cedar Rapids, 91 N. W. Rep. (Ia.) 1,081.

Enclosures Around Basement Sidewalks—A city ordinance provided that no person should obstruct any sidewalk so as to interfere with its convenient use, and that every one should keep around every flight of stairs descending from the sidewalk to the basement a fence or railing at least two feet high. Held: That where the owner of the building had made an opening in the sidewalk, with stairs running to the cellar, the opening being provided with iron doors that constituted part of the sidewalk when closed, a use by the tenant of the opening and doors so as to violate the ordinance, rendered only the tenant liable, and not the landlord. Morrison vs. McAvoy et al., 70 Pac. Rep. (Cal.) 626.

Injuries to Trees in Street—Though under laws 1890, c. 37, art, 5, sec. 8, providing that the execution of a plat of a town vests the fee of dedicated property in the town, a laid-out town acquired the fee in its streets, an abutting owner who had planted and cared for trees standing in the highway in front of his lot was entitled to recover for injuries done thereto by persons using the highway. Lovejoy vs. Campbell et al., 92. N. W. Rep. (S. D.) 24.

Liability on Contractor's Bond—Tools, appliances and articles with which to construct an improvement, which did not enter into it, but remained after its construction, were not "materials" used in the execution thereof, within a bond

binding the contractor and the sureties to pay for all "materials" used in the execution of the contract. Beals et al. vs. Fidelity & Deposit Company of Maryland et al., 78 N. Y. Supp. 584.

Municipal Powers—Municipal corporations can not only exercise such powers as are granted by their charters, or by general law, either expressly or by implication, but also such as are incidental to the powers expressly granted, and such as are essential to the objects and purposes of the corporation. Mayo et al. vs. Dover & Foxcroft Village Fire Company et al., 53 At. Rep. (Me.) 62.

Necessity of Improvement--Where one of the streets of a city, located in an extreme and thinly populated portion, had been well paved with macadam in 1892, and at the time the street was ordered paved with asphalt by the city council, in 1897, the macadam was not badly worn, and the street was in good condition, the subsequent improvement was unnecessary, and special assessments therefor are void. Field vs. Barber Asphalt Paving Company, 117 Fed. Rep. (U. S.) 925.

Platted Alleys—The purchaser of a lot abutting on a platted alley takes to the lot line, and not to the center of the alley. Blennerhasset vs. Town of Forest City et al., 91 N. W. Rep. (Iowa) 1044.

Sewer Ordinance—An ordinance authorizing the construction of a system of brick and vitrified tile pipe sewers, which provides that vitrified tile pipe slants shall be placed in the north side of the sewer in a certain street at the entrance of certain named streets sufficiently described the improvement, though it does not specify in what part of the intersecting streets—whether on one or the other side, or in the middle—the slants are to be placed; it not appearing that the improvement's cost is affected, it being assumed that the middle is meant. An ordinance authorizing the construction of a sewer system is not unreasonable and oppressive, in providing that each corner lot shall have two house slants for connection with the sewers, one on each street. Duane vs. City of Chicago, 64 N. E. Rep. (Ill.) 1033.

Sidewalks—Projecting Signs—A city ordinance prohibiting the erection of any stationary or swinging sign or any stationary awning shed across the whole or any portion of the sidewalks is not necessarily invalid, as being special in character, and discriminating in its effects, because it is limited in its operation to a portion of the city only. Where the city is populous, and the territory thus selected covers the business center and the most crowded thoroughfares of the city, these conditions may furnish reasonable ground for such discrimination, and render it consistent with the requirements of a valid ordinance. State vs. Inhabitants of City of Trenton, 53 At. Rep. (N. J.) 202.

Suspending Flag in Street.—Where a complaint in an action against a town alleged that the town authorities negligently permitted a large flag to be suspended across the street in a most public place, and that the flag was a dangerous obstruction to the street, and was likely to frighten gentle horses, and that, while plaintiff was driving in the street, as her horse approached and attempted to go under it, the horse became frightened, and unmanageable, throwing plaintiff to the street, and causing her injuries, the complaint showed on its face that plaintiff was guilty of contributory negligence in attempting to drive under a known dangerous obstruction, and was therefore demurrable. Town of Crown Point vs. Thompson, 65 N. E. Rep. (Ind.) 13.

Guaranty Clause in Paving Contract Valid in Pennsylvania Case.

A decision was handed down recently by the superior court at Philadelphia reversing the lower court in the case of the city of Williamsport vs. Nelson A. Hughes to recover the cost of the asphalt pavement on W. Third-st., between West and Park-sts. In April, 1893, the property-owners petitioned councils to pave the above streets with asphalt. On Sept. 5, 1893, the city entered into a contract with the Sicilian Asphalt Company to do the work and it was completed and accepted by the city in September, 1894. The abutting property-owners were assessed according to the foot-front rule, payable in ten annual installments. The contract cost of the pavement was about $60,000 for which the city issued bonds based upon the improvement, writing across their face that they were to be paid out of the funds secured by these assessments. Many of the property-owners paid, a number did not, and a number paid a few of the assessments and then stopped. Some of those affected determined to fight the matter in the courts and avoid payment, holding that as the ordinance provided that the pavement should be kept in repair for seven years it was invalid and the assessments could not be collected; that the city should be compelled to pay for repairs, and that no increase in price could be made to cover it. The city contended that the seven years' guarantee did not increase the price, but was a requirement upon the company to put down a pavement which would not need repairs for seven years.

By agreement a trial by jury was waived and the case was heard by Judge Archibald in March, 1901, who decided

against the city and in favor of the property-owners. The city appealed to the superior court with the result that the lower court was reversed and a decision rendered in favor of the city.

Judge W. D. Porter, who wrote the opinion, held that the case was not similar to the action of the city of Scranton vs. E. B. Sturges, in which the supreme court held that the assessment was illegal. The opinion in part is as follows:

If the property-owners were permitted to do the repaving or procure irresponsible contractors to do so, a costly improvement might soon be ruined. The city may itself do the work, and collect the cost from the owner. The covenant was one which the city had power to make, if in the judgment of the authorities it was necessary to protect the improvement, and nothing here appears which would justify us holding that the incorporation of such a covenant in this contract involved an abuse of discretion.

The questions presented by this record were not considered by the supreme court in the recent case of Scranton city vs. Sturges, 202 Pa. ct. 182. The decision in that case was that an action of assumpsit will not lie for a claim of this character, even if it will be well-founded on a legal demand. The facts in that case are thus stated in the opinion of the supreme court, viz.: "The defendant paid his assessment of the original cost (of the pavement) but refused to pay for repairs; before the expiration of the five years the city, for the benefit of the contractors, brought this suit in assumpsit against the defendant to recover his ratable portion of the cost of those repairs." It thus appears that what was there decided was that when an owner of abutting property has paid his share of the original cost of the pavement there can be no recovery against him in an action of assumpsit for his ratable portion of the cost of repairs subsequently made.

The judgment is reversed and judgment is now entered in favor of the plaintiff and against the defendant in the sum of $365.31 with costs.

Front Foot Rule Not Equitable in Oswego Case.

A decision was rendered recently by Justice Maurice L. Wright in the case of Dennis Donovan vs. the City of Oswego, N. Y. The case has been in the courts for over two years. The suit was filed by Dennis Donovan, who represents a number of property-owners on both sides of the river, to test the legality of the charter sections under which the improvement was made, consisting of the asphalt pavement with the incident gas and water connections, and the subsequent assessment was made therefor. The plaintiff's property was assessed at $1,700 before the pavement was laid and at the same figure after it was laid. The greater part of the plaintiff's property is a woodyard. The entire block has a frontage of 200 feet, one-half of which belongs to the plaintiff. The entire block had an assessed valuation in 1898 of $3,000, and the assessment in question against it is $1,179.88, one-half thereof against the plaintiff's land. In the same year the total assessed valuation of the property on the south side of Bridge-st., between E. First and E. Second-sts., of 200 feet frontage, was $68,000. The assessment against it for the paving is $1,100. Thus, the property on the outer edge, worth $3,000, was taxed more than property in the business center worth $68,000. The ratio against the suburban is twenty-four times greater than the ratio against the business block. The same inequality exists in the assessing of a number of other lots. Justice Wright says:

This enormous disproportion in the assessments was due to the practical application of assessing under the rule adopted. Assessment according to frontage is a convenient rule, and is proper respecting properties of substantially equal values. But in this case where the properties are greatly unequal it has resulted in a correspondingly great disproportion among those bearing the burden of the expense of this pavement.

He holds that the assessment for the pavement was illegal and invalid for the reason that no benefit was derived from it. Also, that the assessments for the gas and water conections are illegal because the consent of one-half of the property-owners was not first secured.

Since 1896 Oswego has put down $300,000 worth of asphalt pavement, and assessments were made on the plan declared illegal by Justice Wright, and it is believed that the property-owners on the streets where the pavements have been laid, will bring suit to have the assessments set aside.

Racine Free Water Clause Again Declared Void.

The Supreme Court of Wisconsin rendered a decision, Nov. 28, in the case of the Good Shepherd church vs. The Racine Water Company. The Good Shepherd church refused some months ago to pay bills presented by the Racine Water Company for water used by the church. When the company sent men to shut off the supply, an injunction was issued restraining it. The church officials held that under the terms of the franchise they could not be forced to pay for water, as all churches and schools were to be furnished water without charge. Judge Fish of the circuit court held that the clause was void, and the Supreme Court affirms the decision of the lower court. It is believed,

however, that the decision will raise a question regarding the validity of the water company's charter.

Mobile Is Entitled to Riparian Lands.

A decision recently affirmed by the Supreme Court of Alabama in favor of the city of Mobile against Mary L. Turner in a claim for riparian lands will be cited in a number of suits yet to be pushed to conclusion by the city. The act incorporating Mobile gave to the city certain lands to the water line. Since that time the river has moved eastward and the exposed land has been built on. The city now claims ownership all along the river front, including a great deal of valuable property occupied by railroads, ship docks, marine railways and warehouses. With this decision in favor of the city it is said enough will be realized to wipe out the old city debt, amounting to $2,400,000.

Lighting Contract Enjoined.

The supreme court of Minnesota rendered a decision Dec. 12 in the injunction proceedings of Rudolph Schiffman to prevent the city of St. Paul from awarding a contract for gasoline lighting during 1902 to the American Development Company on the ground that the contract was not let to the lowest bidder. Justice Lovely, by whom this decision is written, says:

Where the legislative body of a municipality has authority to make a contract for lighting its streets with a third party, but has not pursued the proper course provided by law in awarding the contract, the signing and delivering thereof may be enjoined at the suit of a taxpayer, who is not required to await the performance of the contract in material respect before instituting proceedings to restrain its execution.

The council of St. Paul awarded a contract just a few days before the above decision was rendered giving the contract for 1903 not to the lowest bidder, but, it is claimed, to the firm which last year caused the injunction proceedings to be brought. Under this decision, however, any taxpayer can enjoin the execution of the contract for 1903.

Local Exception from Debt Limit Unconstitutional.

The Indiana supreme court handed down an opinion Dec 18, holding the law of 1899, providing an exemption from the 4 per cent. limit of township taxation in certain cases, to be unconstitutional. The law excepted cases where new road bonds were not sold prior to Feb. 27, 1899, in counties where the census of 1890 gave a population between 15,000 and 15,050. The supreme court holds that the act is local because it shuts out counties which might be given such a population by any subsequent census. The court also holds the act of 1901 invalid upon the same grounds that the measure is local and special legislation.

SOME MUNICIPAL METHODS

Actions on Franchises—Officials Actions Attacked—Police—City Finances—Coney Island Park—Compensation of Officials—San Francisco Charter Amendments—Cost of Chicago Work.

Railroad Franchise in Watertown Forfeited.

The common council of Watertown, N. Y., has adopted a resolution declaring the franchise of the New York Central railroad forfeited and all privileges granted under it to be withdrawn. The failure of the corporation to live up to the terms of a franchise granted in 1852 is given as the reason for such action. The company agreed to plank the space between the rails of their road through Factory, Huntington and Mill-sts., substantially grade both sides of the track to within 8 ft. of the margin of the streets, and to maintain suitable gutters and culverts, and not to run trains faster than four miles an hour through the above streets. It has never complied with these provisions.

Opinion on Taxing Franchises with Real Estate in Pennsylvania.

An opinion on an ordinance declaring all franchises real estate, and taxing them as such, was returned by Thomas H. Greevy, city solicitor of Altoona, Pa., December 11. He holds that the ordinance is illegal, and says:

The plain purpose of this ordinance is to assess and tax as real estate street railway franchises, electric light franchises, conduit franchises, gas company franchises, etc. The term etc. must be meant to include public corporations other than those named. Such corporations

are chartered by the state. Their real estate, if any they own, is represented in their capital stock; this stock and the dividends derived therefrom are taxable under the laws of the state. A municipality that would tax the franchise of such corporations as real estate, whether or not the property of such corporation consisted of realty, would simply be duplicating the taxation. This cannot be done except by express authority of the state, and I can find no authority for such action with reference to third-class cities; on the contrary, the reverse has been frequently decided in the courts of this commonwealth.

A Modern Franchise.

The board of aldermen of the City of New York has finally been induced to give its approval of the franchise of the tunnel system and the terminals on Manhattan and Long Islands of the Pennsylvania Railroad, after long haggling over some details for political effect, and possibly, it is said, in hopes of substantial individual rewards.

The provisions of the franchise are in accord with the most advanced ideas upon this subject, in that the city, while granting a perpetual franchise, retains a certain control of its operation, through the provision of a periodical revision of the payments to the city. By means of this provision concessions in other directions can be secured at regular intervals of twenty-five years, as well as revision in amount of rentals. The railroad will pay 50 cents a linear foot of track for the first ten years after completion of the system as planned, and $1 a foot for the next fifteen years. It will also pay $36,000 a year rental for the street space occupied by the terminal station. Other real estate for the station and the surface operations of the company will increase the taxes paid by the company to about a half a million dollars a year.

Denver Officials Committed for Contempt of Court.

Judge John I. Mullins of the Colorado District Court, on Dec. 6, sentenced Mayor R. R. Wright, jr., of Denver and eleven aldermen to serve four months in jail for contempt of court in disregarding the injunction issued by Judge Mullins to restrain the enactment of an ordinance granting a franchise to the Denver City Tramway Company in the form in which it was presented. Mayor Wright signed the ordinance, though this act was specifically forbidden by the court. The ordinance which was passed over Judge Mullin's injunction grants the Denver City Tramway Company a twenty-five-year franchise, and permits the collection of a five-cent fare on all the street car lines of the city for the next twenty years. The mayor and aldermen will appeal from Judge Mullin's decision on the legal points involved in the case.

Waco's Mayor Impeached.

On account of his refusal to execute the orders of the council, the misapplication of public funds and neglect of duty, Mayor J. W. Riggins of Waco, Tex., was impeached by the city council Dec. 5 and the office of Mayor declared vacant. He denied the last two charges and pleaded guilty to the first named, and some other minor charges, but denied their sufficiency as grounds of impeachment. Counsel for the defendant has filed an application for injunction in the Supreme Court.

Bribery Convictions at St. Louis.

The latest incident in the grand jury investigation of the St. Louis bribery scandal is the conviction of five men, all ex-members of the house of delegates, on the charge of bribery, the sentence being five years in the penitentiary. The defendants were released on bond pending motion for a new trial. Out of fourteen cases relating to the bribery scandal thirteen convictions have been obtained. The charge has been bribery or perjury in every case and the defendants have included members of the city council, members of the house of delegates, political "bosses," bankers and others.

Attaching a City Patrol Wagon.

If Lexington, Kentucky, has been inflicted with any offenders of the law recently, the miscreants have not enjoyed a free ride to the police station as the patrol wagon of that city has been attached. This rather extraordinary happening was caused by a fireman who sued the city for his salary. However, the debt and the attachment have been lifted by order of the mayor and the wagon is once more ready for "hurry up" calls. The procedure was unusual, but seems to have been effective.

A "Property Man" to Check Civic Extravagance.

Carelessness in ordinary supplies has caused the comptroller of St. Louis to appoint a property clerk, whose duty it shall be to investigate all requisitions before they are indorsed by the comptroller. In addition to this a letter has been forwarded to each of the heads of the various city departments requesting them under a provision of the municipal code

to send the comptroller an inventory of all city property under their charge. Under the new system of accounting strictly for all expenditures it is estimated that a saving of from $20,000 to $30,000 a year will result. These orders are in accord with the businesslike methods attending Mayor Wells's administration.

Boston Aldermen Are Great Riders.

Boston's aldermen believe in riding in "gigs and chaises," especially since that city has an ordinance which authorizes aldermen to hire carriages and have the cost charged to the city treasury. The aldermen availed themselves of this privilege with avidity and the bills for the first seven months show that the sum expended for carriage hire was $9,191.50.

Of the twelve aldermen in the city government one turned in no bill. One or two presented bills of less than $500, three exceeded $1,000 and one has a bill for $1,366. The carriages are supposed to be hired only for committee work, and it seems that some members of the board must spend the greater part of their time attending to this work. At any rate, Boston's "cabbies" are prospering.

Some Police Statistics.

A recent bulletin of the United States department of labor gives detailed statistics concerning the equipment and cost of maintaining police departments. The per capita expenditures for maintaining the police courts, police force, work house and reformatories in a number of cities is given. New York is listed at $3.21; Chicago, $2.19; Philadelphia, $3.20; St. Louis, $2.88; Boston, $5.03. The Boston expenditures include $1.90 expended by the county. The aggregate expenditures for the police department were: New York, $10,199,206; Chicago, $3,685,982; Philadelphia, $3,036,264; St. Louis, $1,602,182, and Boston, $1,754,151. New York has 7,233 policemen; Chicago, 2,974; Philadelphia, 2,822; St. Louis, 1,264, and Boston, 1,245.

A New System of Police Duty.

Maj. Richard Sylvester, the superintendent of police at Washington, has devised a scheme for the disposition of the police force of the capital into platoons, or tours of duty. The question of how to dispose the police force so as to afford the best possible protection has long been a study with police officials and many plans have been tried. Maj. Sylvester's plan includes eight hours continuous patrol duty for the police, the force to be divided into four sections. One section will be on duty from 8 a. m. to 4 p. m.; the next section for the ensuing eight hours; the third completing the twenty-four hours. The fourth is a shifting section required to be on duty between such hours as emergencies require. There will be a weekly variation of the period during which each section will be on duty.

Under the prevailing system in Washington, which is also used in New York and other municipalities, members of the force patrol the streets six hours, are on reserve six hours, patrol again for six hours and repeat, a practice which involves great irregularity in the lives of the officers. Maj. Sylvester's new system has been reported to the Commissioner of the District and will probably be given a thorough trial.

Can It Be Suppressed as a Nuisance?

It is reported that high winds striking the new flatiron building at Twenty-third-st., Broadway, and Fifth-ave., in New York City, are deflected to the street and are doing much damage to buildings in the neighborhood. Northwest winds make travel on the west side of Fifth-ave very difficult, and all but impossible to women and children. The store doors require the constant attention of stout boys. Much damage to windows is reported on the east side of Broadway on the entire block from Twenty-second to Twenty-third-st., from similar action of the east side of the building. Plate glass windows are blown out and replaced only to be blown out again. Those not injured have been protected by frames and braces. The short block on Twenty-second-st. between Broadway and Fifth-ave. is in trouble no matter what the direction of the wind. Formerly the Hotel Bartholdi suffered from the high winds, but the flatiron shaped tower has changed the conditions and relieved the pressure on the hotel, transferring it to the localities described and apparently to the level of the street surface. The building itself is justifying the computations of its designers, and, under winds with velocity of sixty miles an hour, has no vibration which would cause any anxiety for its safety.

To Better New York City's Financial System.

Controller Grout of New York City has prepared for introduction on the first bill day of the session of the legislature four bills, which he is confident will revolutionize the city's financial system. The four main objects aimed at are:

Reorganization of the sinking fund, by which $8,500,000 of revenues of the sinking fund will be turned into the general

fund, and cut down by so much the tax budget.

Providing for the payment of taxes beginning with Jan. 1, with a rebate of 3 per cent. up to Dec. 1, thus giving the city ready cash with which to pay its bills between Jan. 1 and Oct. 1.

Providing for the payment of improvement assessments in five annual instalments, instead of in one sum, as at present.

Giving the finance department power to issue bonds for permanent improvements, instead of raising money by budget appropriations.

It is understood that Mayor Low approves these bills and that he will urge their passage.

Agreement on Asbury Park Sale.

James A. Bradley, founder of Asbury park, the Y. M. C. A. of the summer resorts, has agreed to a proposition for the sale of his beach and the city sewer system to the city of Asbury Park. A disputed clause in the beach proposition, limiting the uses of the boardwalk to purposes set forth by the legislature, promised to create a prolonged tangle, but Mr. Bradley conceded that the beach should pass to the city without restrictions and a clause was inserted that it should be used only for public purposes. Mr. Bradley also agreed to pay his proportion of the cost if a new city sewage disposal plant is adopted, and as this was the only bone of contention in the sewer proposition every obstacle to the transfer of the beach and sewers was removed. The price paid by the city for the beach and sewers was $150,000, which is regarded as very reasonable indeed.

Coney Island to Be Dignified.

New York's "lower million" is troubled by the proposed plan for the acquirement of 132 acres of land at Coney Island for park purposes. The plan embraces the wiping out of the island's famous bowery and converting it into a national seaside resort. The assessed value of the land purposed to be acquired amounts to $1,834,795. The land desired is that portion of the island lying between Seaside park and Sea Gate, and south of Turf-ave. At a recent meeting considerable enthusiasm was aroused in the project. It is quite likely, however, that a part of the city's population much prefers Coney Island as it is.

Mayor and Aldermen of Perth Amboy Must Serve Without Pay.

The city council of Perth Amboy, N. J., has been advised by James S. Wight, city attorney, that there is no law under which salaries can be paid the mayor and aldermen of that city. A revision of salaries paid city officials was made recently, most of them being increased, except those paid the attorney and the collector of revenue. The reduction made in the salaries of these two was enough to provide a net reduction of nearly $2,400. This amount would give the mayor and each member of the council $300, and it was intended to use the money for that purpose. The city attorney, however, calls attention to the fact that the city charter expressly forbids the payment of any salary to a member of the council or to the mayor.

Results of the Referendum in San Francisco.

At an election held Dec. 4, in San Francisco, seven of the eight charter amendments submitted to the people were carried.

The first amendment adopted relates to the acquirement of public utilities and permits of several propositions being submitted at the same election. The second amendment adds buildings, improvements and lands to the objects for which the people may vote bonds. The third amendment gives the city the right to lay tracks on the same street used jointly by two or more railroad corporations. The fourth simplifies street work procedure and provides that application for such work must come from the property owners to be assessed, the board of health or supervisors. The fifth increases the assessor's salary to $8,000 per year. The sixth gives the city power to clean and water streets by its own employes instead of by contract. The seventh allows $5,000 a year for the relief of aged, indigent and infirm exempt firemen of 1850-66.

The amendment which was voted down gave two instead of three members of the board of public works the right to make contracts for street improvements and gave the supervisors power to grant unlimited extensions of time to contractors.

Only 20 per cent. of the voters in the city were sufficiently interested to go to the polls, but, so far as can be judged by those not fully informed as to the local conditions, the voters expressing their opinion were those whose interest had led them to more or less careful study of the questions involved, which has resulted in the defeat of amendments not strictly correct in principle, and the adoption of none which are seriously objectionable. The amendment requiring certain petitions before street improvements can be

begun seems to be intended as a check upon the board of public works in the absence of the direct responsibility to the people and the mayor provided in the charter, whose form is given in the Question Department. Its value in this respect may be sufficient to offset the haphazard style of laying out street improvements which will result from the resulting inability to proceed according to any definite plan.

Combinations Increase Cost of Chicago Public Work.

The committee of aldermen which investigated the special assessment question in Chicago is of the opinion that property owners are paying 10 or 15 per cent. more for street paving than they should, and that dishonored public improvement bonds have added the larger share of the cost to the work—probably 10 per cent. The committee says that combinations of material men add the remainder of the increased cost. Public improvement bonds, the committee finds, have been selling for 90 to 95 cents on the dollar, and that the contractors who take them in payment for their work increase their bids so as to cover any discount they may have to make for cash. This percentage of discount is paid by the property-owner. The committee found that combinations of dealers in paving material and of sewer builders existed, but was not able to discover a combination among the contractors. The committee suggests that the city guarantee the payment of the bonds, which, it is believed, would cause them to sell at par, and enable small contractors to compete with the larger ones, as a ready market would then be found for the bonds, and there would be no necessity for selling at a heavy discount. The committee also says that the combination of dealers in paving material keeps the prices high; that the large contractor frequently contracts in advance for material, and places the small contractor at a disadvantage. This tends, the committee says, to increase the cost of paving.

The committee's report has been referred to Aldermen Dever, Sloan and Williston, who will consult with the board of local improvements regarding methods for reducing the cost of public improvements, and plans for defeating the materials men's trust.

MUNICIPAL AND TECHNICAL LITERATURE

New Publications—Municipal and State Reports.

New Publications.

Sewage Works Analyses. By Gilbert J. Fowler, M. Sc., Superintendent and Chemist, Manchester Corporation Sewage Works. 142 pp., 12 mo. 11 figures. Cloth $2. P. S. King & Son, London: John Wiley & Sons, New York.

Mr. Fowler is well known for his excellent work on the Manchester sewage experiments and permanent installation, and his book is prepared as a guide to other engineers and chemists upon similar work. Naturally, the general object of the work is the statement of the methods of examining the results of treatment of sewage in septic tanks and filter beds, but the methods of chemical analysis are applicable to effluents from many other kinds of sewage purification works. The first chapter discusses the value of chemical control of sewage purification processes, both mechanical and biological, and gives methods of gauging the sewage flow and of collecting samples when flow is continuous or intermittent, in tanks or beds. It also discusses the control of tanks and beds in the light of the results of the analyses and gives the definitions of required purity of various controlling authorities, as well as the methods of comparing condition of stream and effluent with the purpose of making the purity of the effluent fit the conditions of the stream in the most economical degree.

The remaining chapters give the methods of making analyses for the determination of absorbed oxygen, ammonia, nitrites, dissolved oxygen, chlorine, acidity and alkalinity, iron compounds, solids in solution and suspension, and the constitution of the gases formed in the septic tank and the bacterial filters. The plates show apparatus used in making the analyses and in collecting samples of solids, liquids and gases.

Tables of atomic weights, the metric

system and for conversion of grains per gallon to parts per 100,000 and of gallons of sewage per yard and per acre to cubic meters per hectare and to the convenience of the book, which will prove very satisfactory to engineers and chemists in their study and control of sewage purification plants.

The Cost of Production. By Charles J. Watts. 64 pp. cloth. The Shaw-Walker Company, Muskegon, Mich.

This book takes up the detail of the operations required in manufacturing a machine and running the factory and shows how to keep the accounts of materials used, labor, productive and unproductive, etc., so that one can know the cost of each part of each machine and know how to make allowance for the general expense which cannot be charged directly to individual articles. The example used is an agricultural machine, with the manufacture of which the author is evidently thoroughly familiar. The principle upon which the system of accounts is based is very similar to that outlined in Millener's "Cost Accounts," but the details are very different, the latter book using the manufacture of cement as its principal example. The main reason for the difference is found in the greater detail required in the manufacture of machinery. Mr. Millener develops a system of book accounts, while Mr. Watts shows the methods of keeping the accounts according to the card system, which is eminently fitted for this class of records.

The contractor or engineer who wishes to keep close watch of the cost of works under his charge will find many valuable ideas in both books, but will find it necessary to work out his own system of accounts and cards. Mr. Watts's examples are so full that a contractor, familiar with the class of work he is beginning, will be able to do this without much trouble or necessity for later change of form of record.

Il Cemento Portland della Ditta Fratelli Pesenti fu Antonio di Alzano Maggiore. Studio di Cesare Zamboni. 159 pp.

The author of this book is the technical director of the cement factory of the Pesenti Brothers, which is located at Alzano, Bergamo, Italy. The company owns several quarries of cement rock and hydraulic lime rock and manufactures several grades of these materials. At the Alzano works it manufactures three grades of Portland cement, which correspond with the Portland cements made in some Pennsylvania works from the natural rock. The book is prepared to demonstrate the qualities of this cement and is at the same time an excellent treatise on the composition and qualities of cement and the character of mortar and concrete. It seems to assume that there is nothing concerning the cement to conceal and its three parts go into considerable detail regarding the material. The first part considers the geology of the region, the qualities of the layers of cement rock which are used in the manufacture, the methods of handling the raw material and of burning, grinding and seasoning the cement. The very complete laboratories for chemical and physical tests are also described, as well as the water power and electric transmission systems for operating the works. The second part takes up in detail the qualities of the three grades of cement manufactured from the rock layers in the mines, giving many results of tests of their homogeneity, specific gravity, density, fineness, chemical composition and constitution, time of setting, deformation, tensile, compressive and cross-breaking strength, in fresh and salt water and in air, quantity of water required, adhesion, porosity. The third part takes up the study of mortar and concrete made from these cements with various sands and gravels and in various proportions with reference to each of the qualtities above enumerated. Appendices gives some information regarding hydraulic lime, "cemento blanco" and quick setting cement made at other works of the company.

The principle upon which the book is based is an excellent one and it would seem that such a careful and thorough report of scientific study of the cement and its action in use would be more valuable as advertising matter than the ordinary circular filled with testimonials from users, pictures of buildings in which it has been used and a superficial description of the quarry and works, in which are sometimes included a few tests made without special reference to the best methods of handling the particular brand of cement. Manufacturers and users of cement can learn much from the book and with the advertising manager of a cement plant can see from it the value of such close study of its particular products as can only be obtained from a competent expert working for the company with the apparatus and time necessary to demonstrate its qualties.

Proceedings of the Twenty-second Annual Meeting of the American Water Works Association held at Chicago, Ill., June 10-13, 1902. John M. Diven, Secretary, Elmira, N. Y.

It requires 362 pages to report the proceedings of this convention and there are many valuable papers and discussions which should be on the library shelves of

every water works man. The secretary will send the report at a reasonable charge. This is an association which should have the support of all interested in the supply of water, whether members of more local societies or not. The next meeting will be held in Detroit.

Proceedings of the Sixth Annual Convention of the League of American Municipalities, held at Grand Rapids, Mich., Aug. 27-29, 1902. John MacVicar, Secretary, Des Moines, Ia.

This volume contains the proceedings and the papers presented at the last meeting of the league, nearly all of which were given in Municipal Engineering in September and October. The secretary can supply it to those who wish the stenographic report of the meeting.

Report of the Twenty-first Annual Meeting of the American Street Railway Association held at Detroit, Mich., Oct. 8-10, 1902. T. C. Penington, Secretary, 2020 State-st., Chicago, Ill.

This is a strong society financially as well as in the character of its membership and the discussions at its conventions. The expenses last year were over $8,500 and the treasury held nearly $10,000 balance. The membership is made up of the owners of electric railways, whether corporations or individuals, who are represented at conventions by officers and employes. The live problems of electric railway construction and management are under discussion by competent men at the conventions and the reports are extremely valuable. Such subjects as transfers, signals, discipline by merit system, mutual benefit associations, express and package service, etc., are discussed in the present volume.

Proceedings of the Sixth Annual Meeting of the American Park and Outdoor Art Association.

This small volume contains the report of the convention at Boston, Aug. 5-7, 1902, and can be obtained of the secretary, Charles Mulford Robinson, Rochester, N. Y.

Report of the Smithsonian Institute for 1901. S. P. Langley, Secretary.

This volume contains fifty articles, many of them illustrated, nearly all prepared by masters of the respective subjects, telling in clear and interesting language of the latest progress in all the principal branches of knowledge.

A short sketch of the history of the work of the Smithsonian Institution begins with a paragraph from President Roosevelt's first message to congress, in which he calls attention to the institution's functions and its present needs.

"Bodies smaller than Atoms" is the title of an interesting paper, and as we read "The Laws of Nature," "The Greatest Flying Creature," "The Fire Walk Ceremony at Tahiti," we are reminded of the wide range of subjests included in the report. Wireless telegraphy, transatlantic telephoning, and the telephonograph are discussed by experts in electrical progress. Attention ought to be called to papers on utilization of the sun's energy, forest destruction, irrigation, the submarine boat and automobile races.

Transactions of the American Ceramic Society at its fourth annual meeting at Cleveland, Feb. 10-12, 1902. Edward Orton, Jr., Secretary, Columbus, O.

Among the subjects of interest to our readers which are considered in this volume are stoneware glazes, the composition of porcelain for electrical purposes, the manufacture of artificial sandstone, the equipment of a modern paving brick plant, some gaps in our knowledge of cements. The conventions of this society have very full programs and issue the volumes of proceedings in very handsome form and fully illustrated.

Die Deutsche Cementindustrie, von Paul Mohr.

This is a reprint, not on sale separately, of an article taken from the Jahrbuch Fur Gesetzgebung, Verwaltung und Volkswirtshaft im Deutschen Reiche, published by G. Schmoller, Leipzig, Germany. It gives a general view of the cement industry in Germany and also some statement of the industry in other countries as it may affect German trade. The paper is not exhaustive but shows the fluctuations in the trade. Some tables showing the stability of companies, the capital invested and the dividends paid for a number of years are of special value in this regard. It is seen from these tables that the best years for German cement makers were 1898 and 1899 and that a sharp falling off in profits occurred in 1900. It seems that this was on account of over-production due to the number of new factories and the shutting off of some foreign markets, particularly the United States.

Municipal and State Reports.

Twenty-eighth Annual Report of the Department of Public Works of the City of Detroit, Mich., for Year Ending June 30, 1902. D. W. H. Moreland, Commissioner; Robert Y. Ogg, Secretary.

The period covered by this report is the first full year of operation under a single commissioner, the department having been operated prior to May, 1901, by a board of three members. This gives an opportunity for comparison of results, which shows balances to the credit of all funds this year as contrasted with deficiencies at the time the commissioner took charge necessitating advances from other quarters.

The total mileage of paving laid during the year was 23.1, costing nearly $600,000. About 15 miles was repaving, costing $333,000. Some details of cost and methods of construction are given elsewhere.

New sewers cost $37,000 and repairs and maintenance of the system cost $64,000. The city now has 503.5 miles of sewers, about one-third public or trunk sewers and two-thirds lateral or alley sewers. Few cities, if any, are as well provided.

The state of Michigan labors under the disadvantages of a sidewalk law, which considers the walk a piece of private property, which the city can not improve unless the owner fails on notice to do so. The prevalence of wooden sidewalks doubtless aids in retaining this idea in the statutes. Commissioner Moreland's quick repair wagons have done good service in removing causes for damage suits against the city for defective walks. Why a law which makes the property-owner responsible for the walk does not make him responsible for accidents caused by its condition is not explained. Sixteen miles of artificial stone walks were laid during the year, more than ever before, but 48 miles of plank walk were laid, more than in any year since 1892, except one, 1894-7.

Fiftieth Annual Report of the Board of Water Commissioners of the City of Detroit, for Year Ending June 30, 1902. B. F. Gurney, Secretary. C. W. Hubbell, Civil Engineer.

The receipts of the works during the year were $631,036, of which $150,082 were received from two villages to which water was supplied, $75,000 from the general tax levy of the city of Detroit and $372,565 from the regular water rates.

The disbursements were $643,542, of which $124,959, were for operation and maintenance, $450,639 for construction, $59,573 for interest and $4,000 for bonds.

Eighteen billion gallons of water were pumped during the year or 153 gallons per capita per day. But 106 families within the city limits were not supplied with water. Ten miles of mains were added during the year, making the total about 581.5 miles. The new engine house to hold two new 25,000,000 gallon pumping engines, high pressure, is nearly completed. The sinking fund account seems to have increased about $14,000 during the year, though no transfer to that account is shown in the statement of receipts and disbursements. It is now over $100,000 and $50,000 of bonds coming due next year will be paid from it.

Eighth Annual Report of the Board of Health of Montclair, N. J., for Year Ending June 1, 1902. R. P. Francis, Secy.

The Montclair board employs an engineer with sanitary training as its health inspector and has been fortunate in securing energetic and capable men. Its expenses are about $7,600 a year, $3,000 on contagious disease account with $2,260 on smallpox account in the past year. Salaries of inspectors, attorney and chemist required $2,623. One section of the chief inspector's report (M. O. Leighton) is devoted to mosquito engineering, showing the treatment with oil of mosquito-breeding ponds and making recommendations as to the extermination of the insect. Reports of milk analyses are given under the headings of various dairies.

Report of the State Board of Geological Survey of Michigan for the year 1901. Alfred C. Lane, State Geologist.

This volume of 300 pages contains reports on the geology of several counties of the state and a rather extended consideration of the economic geology of the state. The details of the economic geology in particular fields are developed in separate volumes. Engineers and contractors will be interested in the discussions of the gypsum and cement industries in this report and in a separate volume, not yet issued, on the clays and shales of Michigan.

Report of the Bureau of Mines, Ontario, for 1902. Thos. W. Gibson, Director.

The operations of the bureau during 1901 are detailed in the report which gives an idea of the mineral resources of the province. Our readers will be interested in the reports concerning cement manufacture. The production of Portland cement has increased from 2,033 barrels in 1891 to 350,660 in 1901 and a number of new companies is reported which will largely increase the production in the future. There are many illustrations of the descriptions of gold, iron, arsenic and other mines and works.

Twenty-second Annual Report of the United States Geological Survey, 1900-01. Charles D. Walcott, Director. In four parts.

The first part of this report contains a paper on asphalt and bituminous rock deposits in the United States, by George H. Eldridge, which goes into detail of the manner and locality of occurrence of asphalt as grahamite in West Virginia, as bituminous sandstone in Kentucky, in Missouri and Indian Territory, Oklahoma, Texas, Colorado and Utah as gilsonite or uintaite and other forms, in Wyoming and California. Both deposits which have been developed and those which have not are described and the report should be of great value to many interested in asphalt and its uses.

The third part discusses coal and oil and has a special report on the Portland Cement Industry in Michigan, by I. C. Russell, and one on Chalk of Southeast-

ern Arkansas, with notes on its adaptability to the manufacture of hydraulic cements by J. A. Taff. These papers can be obtained separately from the rest of the report.

The history of Michigan cement manufacture is detailed, giving the characteristics of the raw materials and the product and the styles of kilns. The study of the materials takes up the limestone and marl, the shales and clays, the coal, and the finished product. Short statements of the nature of process of manufacture in the various works are also given. The growth of the industry in Michigan is shown by a large table of statistics.

The Arkansas report describes the process of making Portland cement used in the White Cliffs district and shows the adaptability of the chalks of this and other districts to the manufacture of this material.

Twentieth Report of the State Geologist of New York. F. J. H. Merrill, director of State Museum.

Economic geology is the theme of the first part of this report. The state construction of roads has led to much study of road materials and there are several pages of results of abrasion tests. The detailed studies of geological features are made in the western Adirondacks and in the western part of the state, the former study being of the most ancient formations and the latter of the most recent. The report closes with a preliminary paper in the quarry industry in the southeastern section of the state, and one on the recent developments in the gypsum industry. All the papers are fully illustrated with maps, photographs and drawings, and are certainly of great importance and value.

Twenty-eighth Annual Report of the Board of Water Commissioners of Norfolk, Va., for Year Ending June 30, 1902. H. L. Smith, Superintendent.

The rates for water were reduced 10 per cent. Jan. 1, 1902, and $6,429 were returned to consumers on this acount, new mains costing $12,366 were laid, the sinking fund took $8,500, the general fund of the city took $13,845, and there is a reserve of $12,000. Deducting $17,704 cash on hand at the beginning of the fiscal year, this makes the net earnings of the works $35,937 for the year. The city uses $20,000 of water service for which it pays nothing so that during the past year the consumers have paid about $34,000 more for water than they should, unless the allowance for sinking fund and depreciation is considered to be insufficient.

The water is purified in a filter plant whose efficiency in bacteria removed has not been below 90 but twice during the year. The water is under constant supervision with frequent chemical and bacteriological analyses.

Mayors' Annual Message and the Twenty-sixth Annual Report of the Department of Public Works to the City Council of the city of Chicago for the year ending Dec. 31, 1901. Carter H. Harrison, Mayor.

The report is in its usual satisfactory form, making it possible to find any desired information about the work under way without difficulty. It is handsomely illustrated with many views of track elevation progress and of the work on the intercepting sewers. Work on the former has been delayed on account of high prices for materials, and on the latter by the difficulties met with by the contractors.

The mayor speaks with no uncertain tone regarding the questions of the day. The legislative scaling of the income of the city through its revenue bills seriously crippled the ability of the city to take care of its public improvements and required the reduction of lighting, garbage and other similar bills, except in departments sustained by the water revenues, which have been more than ample for the work belonging legitimately to that department. Mayor Harrison makes an argument from these facts for a modern charter and the unification of responsibility of county and city. He would consolidate the park system, increase the debt limit, now absurdly low, and utilize the water power of the drainage canal. He demands an honest showing of personal property for purposes of taxation, and proposes arbitration for street railway employes and legislation in regulation of operation of roads. The vote in favor of municipal ownership of the street railways and the interest expressed show to him the value of the referendum. The civil service law meets his approval for its removal of the offices from the control of politics, but he recommends some changes in the line of more efficient working, such as increasing the list of certifications of eligibles for appointment and giving power of absolute removal.

The police, fire and health departments meet his approval and the operation of the municipal electric light plant and its great saving of expense to the city are highly commended.

WATER, LIGHT AND SANITATION

High Pressure Service in Philadelphia—Louisville Water Company—Meters in Chicago and New York—Water on Clay—Assouan Dam—Cleveland Tunnel—Electrolysis—Electric Power—Sioux City Lighting Plant—Conduits—Pasadena Sewer Farm—Cuba—Garbage Ordinances.

The Philadelphia High Pressure Fire Service.

The Philadelphia high-pressure fire service, just completed by the Hoffman Engineering and Contracting Company for the city of Philadelphia, was the result of pressure brought to bear on the city by property-owners in the congested district embraced between the Delaware river and Broad-st. and between Race and Walnut-sts., an area of somewhat over 6,000 feet from east to west by 2,600 feet from north to south, and its successful installation has already brought about a very considerable reduction in the insurance rates.

The principal east and west main on Market-st. is 16 inches in diameter; the mains on Walnut, Arch and Race-sts. are 12 inches in diameter. These mains are connected by cross mains from north to south on Delaware-ave. between Market and Race, on Second, Fifth and Eighth-sts. between Walnut and Race and on Eleventh-st. between Walnut and Arch, all of 8-inch pipe. The main is extended around the public building and connected on Broad-st. with the Walnut-st. main by 12-inch pipe. It is also connected on Juniper-st. with the Arch-st. main by the same sized pipe. Looking to the ultimate probability of connecting the east and west mains on all of the cross streets between Delaware river and Broad-st., connecting crosses, closed by blank flanges, have been put in at each intersection.

The pipe is the best quality of cast iron flanged pipe, with the flanges carefully faced and spot faced and the bolt holes bored to templet. The curves and specials are also of cast iron with the flanges faced and spot faced. All of the valves and connections are of cast steel. The pipe was thoroughly inspected and tested at the foundry to a pressure of 800 pounds to the square inch, and after it had been laid in the trench and before filling in was in like manner tested to a pressure of 400 pounds to the square inch. In no case did any leak of any kind show at the joints, a little tightening up making them, in all cases, absolutely water tight in accordance with the requirements of the specifications.

The success of this portion of the construction was largely due to the very careful way in which the pipes were blocked up and handled when placed in the trench, so that the pipe when at rest showed the flanges absolutely closed, even before the bolts were tightened up. The bolts were of the best charcoal iron and the gaskets used were canvas, dipped in tar.

The city is about to erect a permanent pumping station on the Delaware river front at Race-st. and Water-st., which will be connected by a twenty-inch main on Water-st. with the present twelve and sixteen-inch mains. The engines of this pumping station are to be operated with gas fuel and are to be always kept ready for immediate service. Pending the construction of this permanent station, the twelve-inch mains at the foot of Walnut, Arch and Race-sts. have been extended to the river front across Delaware-ave. and connected by specially designed receiving chambers with the city fire boats, one of these boats at present being always kept in connection with the system, the off shore end of the receiving chambers having eight check valves, to which the eight four-inch hose connections of the fire boat are coupled.

The whole system is kept constantly primed by a check valve connection with the general Philadelphia water supply at the city hall. Of course the moment the fire boat pressure is exerted this valve closes. There are also valves at a number of points on the main east and west lines, and also where the north and south mains connect with same, so placed that by closing same, parts of the system can be cut off temporarily at any time it may be desired to effect repairs or put in new construction.

It has been demonstrated on several occasions that the fire boat connections could be made and the pressure put upon the entire system of special fire service as rapidly as the present steam fire engines can leave their houses and reach the scene of the fire, say a mile distant.

The fire plug connections to this system are also, of course, entirely independent of the present plugs, and especially

designed to stand a pressure of 400 pounds, each plug having two openings, to which, however, Siamese attachments can be attached, which will give each plug the efficiency of six lines of 3-inch hose.

At a recent test made by the Fire Underwriters' Association of Philadelphia, at Broad and Chestnut-sts., to ascertain the comparative merits and efficiency of the new high pressure fire service and the best steam fire engine service, the city fire boat was pumping on the new main through 7,000 feet of line at an average pressure at the fire boat of from 200 to 250 pounds, and twelve streams were thrown from two fire plugs through 300 feet of 3½ in. hose, with 1¼ inch nozzles, giving a horizontal distance of 150 feet. Six streams were thrown through the same sized hose and nozzles, giving a horizontal distance of 175 feet. A single stream was thrown through 50 feet of 3½ inch hose, with 2-inch nozzle, 315 feet, considered at least 235 feet vertical.

The steam fire engine, operating under a pressure of 100 to 140 pounds, through a 2½-inch hose, with an 1¼-inch nozzle, threw a stream horizontally 175 feet, or vertically estimated at 125 feet. The fire engine used was a Campbell-Rickards piston type, of about 500 gallons capacity.

It has been fully demonstrated by this test and also by the results of the recent fire at Second and Chestnut-sts. that the fire boats, within five minutes of their connection, can exert a pressure throughout the entire high pressure fire service system which is fully equal to the pressure exerted by a fire engine under full steam, and that each high pressure fire plug is capable of hose attachments which will represent at least the volume of water thrown by ten fire engines, independent of the advantage of much greater hight and distance.

The great advantage of this system which appeals most strongly to almost every city in the United States is its entire independence of the regular designed system of general water supply, which can only be made capable of furnishing the large amount of water required in a very short time and on an emergency by extremely expensive construction in the first place, or by entirely replacing the established systems, as the mains are only designed to furnish the current requirements of water, regardless of fire emergencies.

Louisville Water Company, a Municipal Asset, Is Not Taxable.

The board of equalization decided Dec. 4 that the assessment of the property of the Louisville Water Company for the years 1898 to 1903, inclusive, for municipal purposes was null and void. The text of the decision is as follows:

The relations between the city of Louisville and the Louisville Water Company, even if the water company is looked upon as a private corporation, and not as the property of the city, have been so close in the past and are so close now that the settlement of any issues arising between them ought to be reached on common-sense business lines rather than by long and costly litigation. It is a fact that up to this year the property of the water company has not been assessed for city purposes. In 1892 an agreement was entered into between the city and the water company relieving the company of the payment of taxes and binding it at the same time to furnish water to the city free of cost. This agreement expired in 1892, but by tacit consent of both parties has continued and has remained in force until a short time ago, when the legal department of the city, by Mr. H. L. Stone, city attorney, requested the assessor to make a retrospective assessment of the water works property for the past five years, and also for the fiscal year ending Aug. 31, 1903.

The city has, in the meantime, acquired all the stock of the Louisville Water Company, there being some contention about one share only in which the board of sinking fund commissioners claims ownership, but which, up to the present time, has not come formally into the board's possession. All of this stock is held by the sinking fund as an asset and is undoubtedly the one asset upon which rests to a great extent the splendid financial credit enjoyed by the city. Opinions agree that it can not be sold or otherwise disposed of, except by an empowering act of the legislature. It is also contended that even if such an act were passed the sinking fund commissioners would have no right to sell as long as a single bond of the city of Louisville is outstanding. The stock, therefore, is not and cannot come on the market and may be classed as non-salable at the present time. The sinking fund forming under the charter a department of the city government, it would appear from a common sense standpoint that the water works, being owned by the sinking fund, are city property and, therefore, nontaxable. The city authorities, including former city attorneys, seem to have held this view heretofore and no attempt has ever been made to tax any of the assets of the sinking fund.

In the case now before this board, involving the property of the Louisville Water Company, the city attorney contends that a board of equalization is without power to consider any question

of taxability, but is limited to the question of values. Counsel for the water company entertains an opposite view. The city attorney cites opinions in support of his contention, but this most important question has never been before a board of equalization in Kentucky nor passed on by a court in this state. The courts must, therefore, be appealed to for a settlement.

Chicago City Engineer on Benefits of Water Meters.

In his annual report City Engineer Ericson of Chicago states that if the city would begin to install meters at the rate of 9,327 a year, a saving of $450,000 for the first year, and so on up to $900,000 to $1,000,000 a year in 1912, would be effected; that the city would save this money while paying for the meters, and in ten years 40 per cent. of the taps would be metered. Unless something in this direction is done, he declares that the city will have to spend at least $600,000 a year on the tunnels and pumping plants alone. By having meters on 40 per cent. of all the taps the daily pumpage, even with a population swelled to 2,800,000 by 1912, will have fallen from 346,000,000 to 196,000,000 gallons.

He states that there are 190,000 taps in Chicago from which water is drawn. Of these 6,730 are equipped with meters. Should 3.5 per cent. of all the taps be metered each year he estimates that the result would be as follows:

Year.	Population.	Per cent. of taps metered.	Daily consumption per capita.	Total gallons pumped.
Present ..	2,100,000	3.5	165	346,500,000
First	2,170,900	7.15	135	288,610,000
Second ...	2,240,000	10.80	115	257,600,000
Third	2,310,000	14.45	100	231,000,000
Fourth ...	2,380,000	18.10	92	218,960,000
Fifth	2,450,000	21.75	87	213,150,000
Sixth	2,520,000	25.40	82	206,640,000
Seventh ..	2.590,000	29.05	77	199,430,000
Eighth ...	2,660,000	32.70	75	199.500,000
Ninth	2.730,000	36.35	73	199,290,000
Tenth	2.800,000	40.00	70	196,000,000

The total cost each year to install the meters proposed would be $149,000, the yearly charges the first year $25,000, and the total expense each year would be, for the meters, $175,000; or, in the tenth year, as meters grew more numerous, $405,000 a year. After the tenth year, when 40 per cent. of taps are metered, the whole expense will not exceed $257,000 a year.

New York Water Supply Is "Full of Leaks."

"Any distributing system which requires four times the quantity of water for one and one-half times the previous population must be full of leaks." This is the conclusion which the City club of New York reaches in its report on the waste of water in Manhattan and the Bronx, comparing 1902 and 1885. The conclusion is literally true, for it is the consensus of expert opinion that at least one-half of the supply from the Croton water shed simply runs away without performing any service whatsoever.

Authorities have stated that a year hence the daily consumption of water in New York will exceed the daily yield of the Croton supply. The storage reservoirs will then be used to supply the deficiency and it is estimated that these will serve until 1905. The present daily consumption of water in New York is 134 gallons per capita. The use of meters is suggested as a remedy for this colossal waste.

An Unrecorded Property of Clay.

Under the above title Mr. H. J. Cambie described to the Canadian Society of Civil Engineers some experiments which tend to show that plastic clay, if thoroughly dried, loses its plastic quality, and if water is then added in sufficient quantities it will become a liquid mud, without cohesive qualities. In one experiment the dry, hard lump of clay absorbed 50 per cent. of water in weight without change, but 60 per cent. caused the action desired. The author attributes landslides in districts having long dry periods to this action of clay strata near enough to the surface to be thoroughly dried out, and then collapsing under the action of the water during a rainy season even of a few days. He thinks that some landslides may be attributed to the action of irrigation water on strata of clay dried out by years of drought and recently subjected to the percolation of water from irrigation ditches.

The Assouan Dam Completed.

The Assouan Dam on the Nile was completed Dec. 10, ahead of contract time, at a total cost of $12,500,000. Its greatest height is 131 feet, width on top, 23 feet, and length about 1¼ miles. The foundation was laid Feb. 12, 1899, by the Duke Connaught, and the last stone Dec. 10, 1902, by the Duchess of Connaught.

Cleveland's Water Works Tunnel Complete.

Cleveland's water works tunnel under Lake Erie is completed after six years of continuous labor. Over fifty lives have been lost in the tunnel through various accidents since the work began. The tunnel is 100 feet below the bottom of the lake. It is nine feet in diameter and 26,000 feet in length. Pure water will be supplied the city of Cleveland from an intake crib five miles out in the lake. The capacity is estimated at 200,000,000 gallons a day.

Electrolysis Suit Entered by St. Paul, Minn.

The board of water commissioners of St. Paul, Minn., has made application in the district court for a permanent injunction against the City Railway company to restrain it from using the mains of the city water system as a conduit for its return electrical current. The electrolysis produced, it is asserted, is causing the pipes to rapidly disintegrate. The board asks that the company be required to make restitution to the extent of $500,000 for alleged damages. The company denies the alleged damage and maintains that the double trolley system is not feasible in St. Paul.

An Ordinance to Prevent Electrolysis.

The city of Atlantic City, N. J., has just passed an ordinance to prevent damage to metallic structures by electrolysis which is a model of brevity and seems to cover the ground completely, at the same time leaving the means to be adopted and the responsibility for the result entirely with the electric railway companies. The requirements are sufficiently severe to enable the city to demand the adoption of the double trolley system if danger is not othewise eliminated. The principal provisions of the ordinance are as follows:

In no case will bonding to the water mains or other conductors, not provided for the express purpose, be allowed in order to equalize the potential between such conductors and the rail, but means must be taken by furnishing and insulating a complete metallic cricuit both inside and outside the city limits, to effectually prevent leakage of current from the wires or rails of the railway. The company or individual operating the street railway may select the particular method of securing this protection and will be held responsible only for the result. It shall so confine its current to the metallic return circuit which it shall provide as to comply with the following conditions:

(a) The maximum difference in potential between any part of the metallic return circuit and any water or service pipe, or other metal conductor not intended as a part of such return circuit, shall not at any time exceed ¼ volt. (b) The difference in potential between any two points upon said metallic return circuit within a distance of 200 feet from each other, shall not at any time exceed ¼ volt. (c) The current passing along any water or service pipes or other metallic conductor not intended as a part of said return circuit shall not, at any given time and point, exceed one ampere.

In February and August of each year, a test shall be made for the purpose of detecting the passage of stray currents in the ground, and between the metallic circuit of the railway and the water and service pipes and other metallic conductors liable to be effected thereby, conducted by an expert to be agreed upon by the company or individual operating the railway and the engineer and superintendent of the water department, or by the city electrician.

Whenever it can be shown that damage to water or service pipes, or other metallic conductors, has been caused by electrolysis due to the operation of a street railway, the company will be held responsible therefor, and subject to damages amounting to the cost to the water department of discovering and repairing the injury. The penalty for failure to remedy is $50 to $200 a day.

An Electric Power Plant to Cover a Wide Area.

A wholesale water power electric plant which will generate electricity and distribute it over a large section of the state is now under construction near Kent, Conn. Its location is at Bull's Falls on the Housatonic river. It will be possible to transmit the current as far as Derby, possibly to Waterbury, and among other things the power will be used for town and city electric lighting, trolley and third-rail roads.

The method employed in utilizing the water for the power plant is of some interest. A dam 200 feet long and twenty feet feet high is to be constructed across the Housatonic and an immense water storage reservoir built. The water from this reservoir will be conveyed about two miles through a canal to the power house where there will be a fall of 116 feet. The plant will generate 7,000 horse power when run at its full capacity. The work involves an outlay of fully $2,000,000 which is to be met by a syndicate.

Results of Municipal Electric Light Plant in Sioux Falls, S. D.

A year's experience of municipal ownership of the electric light plant in Sioux Falls, S. D., has proved the plan to be very successful. The plant and improvements made since it was installed aggregate $12,544.09 in cost, and the operating expenses during the year amounted to $4,482.95. The city, it is stated, is three times as well lighted as ever before, and the cost is less than it ever was under private ownership. The municipal plant was begun with sixty-five arc lights, which have been increased to 105 lights. It is now proposed to change the smaller dynamo for a larger one.

Wires Must Go Underground In Brooklyn.

All telegraph, telephone and electric light companies of Brooklyn have been notified by Commissioner Monroe of the department of water supply, gas and electricity of Greater New York, that they must place their wires underground by May 1. He has also directed the Brooklyn Rapid Transit company to place its feed wires and all other wires except the trolley wires underground.

Profits of the Pasadena Sewer Farm.

The Los Angeles Times gives some account of the operation of the farm which Pasadena uses for purifying its sewage, in turn irrigating and fertilizing the land, from which the following statements are extracted:

The sewer farm consists of 300 acres, five miles south of town, which were bought unimproved a few years ago. The land was connected by pipes with the sewer drainage of the city, and now all the sewage is conveyed thither and spread over the ground. The result is that land that had been regarded as worthless has been made to "blossom as the rose."

The council has a special committee whose business it is to look after the farm. A superintendent, S. O. McGrew, is appointed and resides on the farm with his family. He keeps four hired men steadily, and employs as many others as are necessary from time to time. Recently the work of picking the walnuts was begun. This year's crop from city acres promises to yield about 350 sacks of 100 pounds each, which should bring a revenue of about $3,500 into the city. Mexicans from the ancient village of San Gabriel are employed to pick the walnuts off the ground after they are flayed from the trees by the farm's hired men.

It is an interesting sight to behold the senoras, senoritas and their less industrious husbands, sweethearts and progeny going through the orchards earning from 60 cents to $1.50 a day at gathering the nuts. The farm has a walnut washer on the ground. The Mexicans husk the nuts as they pick them and then they are carted to the horse power washer, after which they are stored in a big barn on the premises to await the highest bidder.

Considerable hay is raised on the sewer farm each year, as well as other farm products, and now ninety fat hogs call the place "home." More land is constantly being laid out in products of all sorts. Several citizens have expressed their willingness to pay the city a handsome price for the sewage, but the council has found that it pays better to keep the farming in the municipal family.

The total income from the farm last year was $5,075.66, as given in the official report, $4,603 of which was from walnuts, the rest being from hogs. The city also used about 200 tons of hay from the farm.

Sanitation in Cuba.

The Cuban lower house of congress has passed a motion authorizing the president to use $400,000 to aid city governments of the island in maintaining the good sanitary conditions which prevailed at the close of the United States' intervention. The cause of this action is said to be almost entirely due to the agitation raised in the United States on the report of First Secretary Sleeper that the sanitary conditions were retrograding, gradually but surely. Sanitary inspectors are said to be more lenient and there are numerous violations of sanitary laws.

Garbage Collection Ordinance of Newark, N. J.

The new law regulating the collection of garbage after Jan. 1 in Newark, N. J., was signed by Mayor Seymour Dec. 13. The ordinance provides for the assortment of garbage into three classes: Ashes and rubbish, refuse of an animal or vegetable nature, waste and other paper.

Each class will require a separate receptacle, the second of which shall be water-tight and shall have a cover. The receptacles for the first and third classes shall be such as will not spill or leak. On the collection days the refuse of each dwelling house or other building is to be placed on the curb or such place as is convenient for the collector to get it.

Penalties provided by the ordinance for violation of its provisions are a fine of twenty-five cents for the first offense and fifty cents for the second and subsequent violations.

PAVEMENTS AND ROADS

Kreodone Pavements—Oil on Road—Asphalt Trust—Brick Prices—Prizes to Repair Gangs—Highway Construction—Rochester Streets—Bituminous Macadam—Pavement Repair.

Kreodone Wood Block Pavements and Paving Conditions in Chicago.

We are indebted to Mr. Frank W. Moulton of Chicago for a well written account of some of the recent movements in the search for the pavements best suited to Chicago conditions. Mr. Moulton says:

Although a layman, I have been for years an interested and sometimes amused spectator of paving conditions as they have existed in Chicago. Partly as the result of the marvelous growth of the city, cheap pavements have been extensively laid—seemingly as mere makeshifts. The question of durability—possibly the most important question to be considered—has apparently been lost sight of altogether. Miles of streets have been paved with cedar blocks, cut to a great extent from dead trees from the burned-over forests of Wisconsin. Some pavements commence to deteriorate as soon as they are laid. These cedar block pavements had begun to deteriorate before they were laid. Placed on board foundations, they naturally would not have lasted very long under heavy traffic, even had the cedar blocks been at the outset of the best quality.

Granite blocks have been extensively laid in the heavily trafficked streets of the business section. Asphalt pavements have, during the past few years, been quite extensively laid. Macadam, which is dusty when dry and muddy when wet, is quite extensively used in certain of the residence districts. Brick has been tried.

The most recent new form of pavement laid in the city is the Kreodone wood-block pavement, as it has been laid on the Rush-st. bridge and in Michigan-boulevard.

Rush-st. bridge is without doubt the most heavily trafficked bridge in the United States. A very fair estimate would place the number of vehicles passing over it daily at 11,000. This estimate is certainly below rather than above the true number. It should be understood, too, that most of these vehicles are drays and trucks of the heaviest character. Prior to October, 1899, this bridge had been paved time after time with untreated rectangular wood blocks. The Kreodone treatment of wood blocks, having been brought to the attention of the city engineer, several representatives of the city visited Indianapolis for the purpose of inspecting the Kreodone block pavements in that city. Upon their return their report was favorable and the city decided to pave one-half the bridge with Kreodone-treated yellow pine blocks and the other half with untreated blocks. This was done as an experiment, as it was desired to test practically the Kreodone pavement and ascertain if it would last under the enormous traffic which passes over the Rush-st. bridge. It should also be stated that the Kreodone-treated blocks were laid under a ten-year guarantee.

I examined both the untreated and the Kreodone blocks a short time ago, and found that the untreated blocks had worn from one to two inches, and unevenly, while in the case of the Kreodone-treated blocks no wear was perceptible—in fact they appeared to be just as perfect as when first laid. Since the pavement was laid in October, 1899, not a single block has been replaced, nor has the pavement required repairing in any particular.

Mayor Harrison in his annual message to the city council, April 7, 1902, declared it advisable to introduce a more general competition in the paving market, and suggested that the Kreodone block pavement should be given a more extensive test. After referring to the paving of the Rush-st. bridge, he said: "The traffic on this bridge is of the heaviest character, and the bridge being narrower than the street on both sides of it, and carrying all the light traffic of a large portion of the North Side in addition to the heavy traffic from the wholesale district, from the river docks and from the railroad freight houses, the paving is subjected to what is, in all probability, as severe and exacting a test as any single piece of paving is put to in Chicago."

One of the city's assistant engineers reported that he had examined the two kinds of pavement laid on the Rush-st. bridge and found "that the untreated pine block pavement shows a wear at some points of as much as two inches, while in the roadway paved with treated blocks the maximum wear seems to be about one-eighth of an inch, and is very uniform. I should say that the average wear between the two roadways is in favor of the treated block six to one, or an average wear of three-fourths of an inch in the common block and one-eighth of an inch in the treated block."

A short time after the pavement was

laid on the Rush-st bridge it was decided by the South Park commissioners to lay, experimentally, a small section of Kreodone pavement on Michigan boulevard. Eleven hundred yards of Kreodone pavement were accordingly laid in front of the Auditorium hotel in Michigan boulevard, between Congress and Van Burensts. In a letter dated Aug. 15, 1902, Mr. J. F. Foster, general superintendent and engineer of the South Park board of commissioners, said that the pavement was a "most excellent specimen of wooden block pavement. It is practically in as good

Kreodone as a wood preservative is a modified form of and a distinct improvement on creosote oil, made by the Republic Chemical and Creosoting company of Indianapolis, Ind. After many years' experience in the making of creosote oil and in the treating of paving blocks, railroad ties, bridge timbers, etc., they concluded that it did not entirely serve the purposes intended because of its volatility and lack of uniformity in quality. In the case of wood pavements the use of a volatile oil meant, in a degree, spongy pavement and a consequent bulging, after

KREODONE PAVEMENT, MICHIGAN BOULEVARD, CHICAGO.

condition today as it was when it was laid, although the traffic on this part of Michigan boulevard is very great. No repairs have been made on it, and nearly everyone with whom I have talked concerning it is greatly surprised to learn that it is in such excellent condition."

On close inspection I find this piece of pavement in as perfect condition as when first laid. The eleven hundred square yards of 5-inch long-leaf yellow pine blocks here referred to were laid on a seven or eight-inch cement-concrete foundation. Considering the fact that the pavement cannot decay, I think I may safely predict that it will be in serviceable condition fifty years hence.

a limited period. Being a product of tar, creosote oil varies in quality according to the quality of the coal from which the tar is extracted and the manner in which it is extracted.

Kreodone is a direct result of a series of experiments extending over a period of years. It is a fixed oil and uniform in quality. Once in the wood it remains there forever. Creosote oil at 130 deg. F. will frequently lose almost 60 per cent. of its bulk, owing to its volatility. The tar acids in the Kreodone are fixed and will not volatilize at that temperature.

In the treating of wood with kreodone the same process is followed as in the case of ordinary creosoting. Wood pav-

ing blocks, for instance, are first placed loosely in iron cages which are on wheels and are run into a large steel cylinder which is then hermetically sealed. This cylinder is lined with steam pipes and connected with vacuum and oil pumps. The blocks are gradually heated to a point where the sap, albumen, starch, etc., in the wood are vaporized. The vacuum pump is kept in operation removing these materials as fast as the heat transforms them into vapor. Then the kreodone oil heated to 150 degrees F. is turned into the cylinder, and pressure from the oil pump is applied until at least ten pounds (1⅛ gallons) of the oil penetrates each cubic foot of the wood. The surplus kreodone is then drawn off, and the blocks, when cool and dry, are ready to be laid in the street.

Let us now for a moment consider how nearly the kreodone pavement approaches the perfect pavement. Probably the first thing to be considered is durability. In addition to what has already been said relative to the durability of the kreodone pavement laid in Chicago, it should not be overlooked that a great deal of the same kind of pavement has been laid in Indianapolis, the first of which was laid about seven years ago. None of this pavement has yet required repairing, even in the slightest degree Furthermore, the kreodone pavement does not decay. Kreodone remains fixed in the wood and moisture cannot enter. The perfect pavement should be noiseless. The kreodone wood block pavement approaches this requirement very closely.

It is very easily cleaned, and when it is kept in a clean condition it does not require sprinkling.

The fact that it is a sanitary pavement should not be overlooked. In these days of disease germs and microbes the kreodone pavement will come as a blessing. Kreodone, considering its constituent qualities, might be sold as a germicide.

KREODONE PAVEMENT ON NORTH DELAWARE STREET INDIANAPOLIS.

Further Report of Oil on an English Road.

The sequel to the experiment on using oil on an English road, reported on page 464 of Municipal Engineering for December, 1902, is given in the following clipping from the London Morning Post:

Those who have followed the career of the oiled road in the United States were probably not surprised when the mile of road near Farnborough which was treated with oil gave way under the strain of an English autumn. While the weather was fine the oil served its purpose of laying the dust to perfection, and this measured mile, unlike some others in Surrey, became quite a favorite with the drivers of

motor cars. When, however, the rain came the road developed into a slough of the most unpleasant kind—a sorbet of water, oil and mud, which smelt, which stuck, and which has given the local authorities much trouble to remove. But, as was recorded in the Morning Post before the Farnborough mile was laid down, the oiled road has been abandoned in many places in America because even in dry weather the mixture of dust and oil when splashed up by passing vehicles had proved ruinous to most clothes with which it came in contact; and even on railroads it had proved unsatisfactory for analogous reasons. In Italy another method, aiming at the same results as the oiled road, has been tried, and the roads, instead of being treated with crude oil, are laid with gas tar during the dry season. The road, it is said, becomes very hard and compact, the dust ceases, and the rainwater flows off without penetrating it, so that there is no mud formed. Perhaps this method might prove more adaptable and less susceptible to attacks of rain. But the Italian summer is of a very different kind from that enjoyed in England, and can give the tarred road a start which it could scarcely hope for in this "sceptred isle."

Suit to Foreclose a Mortgage on the Asphalt Trust.

Suit has been instituted in the United States circuit court at Trenton, N. J., against Henry Tatnall and John M. Mack, receivers of the Asphalt Trust, to foreclose a mortgage held by the Land Title and Trust company, as trustees for the holders of gold certificates. The trustee also asks that the securities and holdings of the defunct trust be sold in the interest of the gold certificate holders, claiming that unless timely measures are taken the holders of the certificates will suffer irreparable injury. Apparently the trustee does not believe there will be anything left for the holders of the preferred and common stock of the Asphalt Trust.

It is asked that the proceeds of the sale be applied to payment of the gold certificates and interest. There are outstanding about $30,000,000 of these gold certificates, and the accrued interest is nearly $3,000,000. They are held by various individuals, firms and corporations, and their payment, together with the payment of semi-annual interest, is guaranteed by the Land Title and Trust company.

The gold certificates were issued by the Asphalt Company of America and to insure their payment there was deposited with the trust company a great quantity of stock of the subsidiary companies as collateral. When this company and the National Asphalt Company were merged further securities were deposited. The Asphalt Trust agreed to pay to the Land Title and Trust Company $745,768 semi-annually for the benefit of the holders of gold certificates. In the event of failure to make these interest payments the trust company was empowered to make them from the collateral securities deposited.

On the first interest payment the asphalt trust defaulted to the extent of $185,788, and it has defaulted on three installments since due. It also failed to redeem $300,000 certificates falling due last January. To meet the payments the trust company has advanced funds to the extent of $2,743,075. Under its agreement the asphalt trust is required to pay 6 per cent. interest on this sum. It is set forth in the bill filed by the trustees that a majority of the holders of gold certificates have requested that the securities and property of the asphalt company be sold to satisfy their claims. The Equitable Trust Company of Philadelphia also instituted suit against the receivers of the Asphalt Company of America and the National Asphalt company and the Land Title and Trust Company. The purpose of the suit is to compel the sale of $5,988,420 worth of stock of the Asphalt Company of America, which was deposited for an issue of a like amount of collateral gold certificates of the National Asphalt Company.

Letting of Asphalt Paving Contracts Enjoined.

Judge McVey of Des Moines, Ia., has enjoined the city council and the board of public works of that city from awarding several asphalt paving contracts because the prices bid are excessive. He seems to have taken this action in the belief that competition had been stifled by the asphalt trust and that the weather will be such for some time that asphalt pavements cannot be laid, giving time for again receiving bids. Milwaukee property owners are considering similar action.

Average Prices of Brick Paving.

Data gathered for the use of the streets and alleys committee of the municipal assembly of St. Joseph, Mo., in determining the tests to be required of paving material shows that the average price of brick pavements in the different cities in the Central West is as follows:

Council Bluffs, $1.97½; Des Moines, $1.76; Kansas City, Mo., $1.61¼; Kansas City, Kan., $1.36; specifications different from those here; St, Paul, $1.97; St. Louis, $2.30.

The specifications in St. Louis are the same that were proposed in the recent ordinance of President Imel, of St. Joseph, who is endeavoring to secure competition

in brick paving in that city. The specifications in Kansas City, Mo., are the same that are now in use in St. Joseph in which is stated the brand of manufacture upon which bids will be received.

Prizes to Repair Gangs in Brooklyn.

Prizes aggregating $250 have been awarded to members of the repair gangs of the bureau of sewers and highways in Brooklyn, N. Y., who have, in the judgment of their superiors, done the most meritorious work during the last ten months. In addition to the money prizes certificates of merit were also awarded. The advantage of having these certificates, it is announced, is that they will entitle their holders to preference when work is slack this winter and when it will be impossible to keep all hands employed. The prizes were donated by Borough President Swanstrom, Public Works Commissioner Redfield and Superintendent Thatcher of the bureau of sewers.

New York State Highway Construction.

On December 1, 1902, the state construction of highways had proceeded to the extent shown by the following statement:

One hundred and ninety-three miles of road completed, comprising seventy-two roads in twenty different counties.

One hundred and sixty-two miles of road in process of construction, comprising forty-eight roads in eighteen different counties.

Three hundred and fifty-five miles total completed and under construction.

Three hundred and thirty-eight miles of road surveyed and mapped, comprising ninety-nine roads in twenty-two different counties, for which the boards of supervisors have appropriated their one-half of the cost, estimated at $1,391,913, the construction of which is waiting for an equal appropriation from the state.

Four hundred and sixty-six miles, a portion of which is mapped and in hands of the board of supervisors.

Eight hundred and forty-eight miles petitioned for and not yet surveyed and mapped.

Two thousand and seven miles of road total for which petitions have been received from forty-three different counties.

The counties have petitioned for 1,752 miles of road for which the state has as yet made no appropriation and which, at $4,000 per mile, will require as the state's share about $7,000,000.

Extension of Good Roads in New Jersey.

In his annual report to Governor Murphy of New Jersey State Road Supervisor Budd shows that 796 miles of stone roads have been built, and that it is now possible to travel from Jersey City to Atlantic City on smooth, hard roads. The state has appropriated, so far, $1,263,168 for building roads. The northern counties have built on their own account 225 miles. The legislature will be asked to increase the annual appropriation to $300,000. During the year 155 miles of road were constructed and 67 miles are nearing completion. Plans and specifications have been prepared for 96 additional miles.

Methods of a Massachusetts Grade Crossing Commission.

The grade crossing commission, appointed to examine into the necessity of abolishing grade crossings of the consolidated road in Attleboro, Mass., held its first public hearing Dec. 10. A large number of business men, professional men and land owners were present to give testimony relative to the matter, showing that public necessity and safety in Attleboro demanded that several crossings should be abolished. The commission was given an opportunity to view the crossings at noon with the trains at work, and scores of men and women on their way home from work using the dangerous ways across the tracks. The commission thus obtained, from this practical demonstration, some idea of the necessity of abolishing the crossings as a means of public safety. The commission is composed of Judge James R. Dunbar, Herbert L. Barker, attorney, and William Jackson, city engineer of Boston.

Rochester, N. Y., Improvements for 1902.

In his annual report for the year ending Nov. 1, 1902, city engineer Fisher of Rochester, N. Y., says that the work in the bureau of engineering is well advanced and all work commenced this year will probably be fully completed. The approximate length and cost of pavements finished and under way that will be completed are as follows: Asphalt, 1.48 miles, approximate cost $72,000; brick, 1.05 miles, $54,000; Medina block stone, .01 mile $700; macadam, 1.14 miles $58,000; total miles 3.68; total cost $184,700. In addition 1.66 miles of sewers have been laid at a cost of $21,000; ten miles of sidewalks, $30,000;

also miscellaneous work, including street grading, curbs separate from pavements, snow cleaning and various other work amounting to about $25,000, making a total of $260,700.

Who Shall Lay Bituminous Macadam in New York?

The New York Sun has the following report of a recent action of the New York Board of Estimate:

At the meeting of the Board of Estimate yesterday a proposition to change the paving contract specifications so as to permit the laying of bituminous macadam was discussed. J. Rake of the Barber Asphalt Company opposed the change and offered to lay the same sort of pavement for less than $2.40—the price asked by the Warren Company, the patentees of the new pavement.

Frederick J. Warren said that the Barber Company's offer was made so that they could lay an inferior bituminous pavement and discredit the new method.

"We wish to experiment with the new pavement, and to do so the regulations must be changed," said Borough President Cantor.

"And leave us out?" asked Mr. Rake.

"No; but we do not care to trust the enemies of this pavement with a trial. It would not be fair."

Final action on the matter was deferred.

Repairs to Pavements and Payment for Them.

In an interesting lecture upon pavements and paving methods before the Indianapolis Commercial club, Mr. Clarence A. Kenyon made the following pertinent observations regarding methods of conducting the repairs of pavements and the principles upon which the cost of making them should be assessed:

I come now to the question of repairs to pavements. This is most important and very little understood. Many think that you can go on repairing an asphalt pavement indefinitely, and that the only reason the asphalt pavements are in such poor repair is because they have been neglected, and the stitch in time adage has not been worked. Of course there is something in that, but not anywhere near to the extent commonly believed by observant and thoughtful people. How would you apply the stitch in time adage to the 'deacon's wonderful one-hoss shay?' A pavement has a certain life, just as trousers and shoes have, dependent upon—first, their quality and, second, upon the kind and amount of usage.

There is another common error as I see it, and that is that the city should own its own asphalt repair plant, and then it could do what the companies won't do, repair every little break just as soon as it occurs. Several cities in this country and Europe have tried it and abandoned their plants afterward. The difficulties are:

First. The difficulty of getting a supply of asphalt.

Second. The difficulty of having an expert engineer and expert workmen who know how to handle and lay the material at hand.

Third. When you remember that it takes from 300 to 400 degrees Fah. to melt Trinidad asphalt, and it has to be kept at that temperature for ten hours to properly mix with the fluxing oil before it is ready for use, and then you must heat the sand and stone dust, and get up steam and mix it and get a wagon to haul it to the street, and have the men and rollers and fire wagon and tampers, etc., there all ready so the material won't get cold, all to make that stitch in time, to repair a hole not larger than a man's hat, the cost has been $25 or more. Where will your repair fund go to at this rate?

On brick and wood block the city can easily take over the repairs. In Paris cleaning and maintenance are kept as one item of cost. All of the minor repairs are made by the cleaners; a break in the wood pavement is repaired by a "hurry-up-call" to the city yard. A light spring wagon, some blocks, two men, some sand and cement, a tamper and a couple of hand axes, and you have the repair outfit complete. No machinery, no heating, no mixing, no waiting; take out the defective blocks, put in a new one, grout it, tamp it, and drive on. This department has grown until now only about 10 per cent. of the wood paving is done by contract; the city saves the contractor's profit. While such a department works well for stone, macadam and wood blocks over there, it does not work for asphalt pavements, for the reasons given.

Such a department, properly organized, might be a good investment for this city, but politics would have to be kept out of it.

There are two theories upon which street improvements are made. First, that the cost of all paving, repaving, repairs and cleaning should be paid out of the general revenues of the city. This is grossly inequitable unless all streets shall be paved immediately and kept in equal repair and equally clean. This is impracticable, expensive and our debt limit would not permit it. You cannot pave part of the streets and leave the others until you can come to them. Some streets in this city have already been paved twice, and some three times, and some not at all. The man whose street remains unpaved not only helps pay for paving his neighbors' street once, twice, but may three times. He has helped keep it clean and helps repair the same for thirty years and his neighbor has done nothing for him.

The second theory is that building a pavement in front of a man's property benefits it the cost of the erection the same as building a house on a piece of property improves it the cost of the house. It cannot be positively said that the land will immediately sell for the cost of the pavement more than the man

held the lot to be worth, and you will find the same true in the case where the house was built on the lot instead of a pavement in front of it. Many times the lot is increased in value many times the cost of the pavement. So you see there is never perfect equality and there never can be in taxation. No perfectly equitable system has ever been or ever will be devised, the single taxer's dream to the contrary notwithstanding.

This theory of benefits, with its inequalities, has proven to be the best there is up to date, and certainly more progress has been made under it by growing and ambitious cities than under any other. That idea and the Barrett law have done more for Indianapolis within the last dozen years than any of us could have dreamed. Indianapolis has been changed in that time, as if by a magician's wand, from an ugly country town of 60,000 population to one of the beautiful cities of the country with a population of 180,000. I think few will claim that our modern city charter was not a potent factor in all of this. To start with, it took two-thirds of all the residents to remonstrate to kill an improvement. In fact, civic pride was so wrought up that a remonstrator gained the contempt of his neighbors and the press frowned on the slightest suggestion of a backward step. But with time and the increase of improvements there developed quite a large class of men who were land-owners on more than one street, and they began to look for ways and means of stopping street improvements, at least where they were concerned. They appealed to the legislature with success and one by one amendments have been made to the charter until now almost any improvement can be defeated by one or two persistent opponents. It must be remembered that with the exception of a few streets in the center of the city the same lot has not been improved but once; I mean, sewer, pavement and sidewalk, so that property is not suffering from excessive improvement. But it is the one owner of many lots on different streets that feels it. But should that count? That is only because of his greater wealth. The theory is based on the equality of one owner for each lot. But the fact remains.

Some of the pavements first laid have worn out and the owners are demanding that they shall be replaced out of the general fund, and really so extensive has this sentiment grown that recent efforts to re-surface several streets by the city have failed because of it, although quite a number of streets have heretofore been resurfaced at the cost of the abuttor.

Let us examine the matter. A new improvement on, we will say, Virginia-ave., is absolutely necessary for that street to maintain its place or prestige, hence to improve it will benefit it and the property alongside. Can I refuse to buy a new carpet for our parlor because I bought the first one, and because our friends and neighbors helped to wear it out? Ten years ago a poor blacksmith bought on time a lot in North Indianapolis on a street not likely to be improved. He bought it in that obscure place for that reason. He has been paying for that home with a struggle. He has foregone pavement and sidewalk for ten years. He has never seen Virginia avenue. Why should his humble home be taxed to pay for resurfacing Virginia-ave. and Washington-st. and all other streets? But what about the owners on Meridian-st. that have paid for three pavements? Shall they now be called upon to help pay for resurfacing fifty or 100 others, none of whom have helped pay for resurfacing Meridian-st.?

The charter now provides that the resident property-owners on a street can name the kind of improvement by filing a petition. The present board has modified under this clause, resolutions calling for brick and asphalt to macadam. If they can do that, why not to gravel? When it became known that after the property once made the improvement the city became holden not only for repairs, but for a new street, would we get anything better than macadam or gravel? The cleaning, sprinkling and repairing of which cost in the aggregate three times, at least, what it costs to clean and repair a modern pavement. The cleaning and sprinkling and repairing alone of any considerable area of macadam streets would increase the tax levy to an extent that would alarm the conservatives; add to this the cost of resurfacing and you can easily see the result. Public officials could not be found that would put the levy at the necessary altitude, and if they did, they would be retired from office at the first election. What would be the result? The streets would, in a few years, be as though they had never been paved, and Indianapolis, the beautiful, would be on the toboggan, and her only chance for resurrection would come when the pendulum should swing the other way on account of some great event that would stir civic pride and lift people out of themselves.

This is right before you, and has been repeated in many cities. Look at Milwaukee. Buffalo was only saved by the fair. Look at St. Louis. The conservatives got a law by constitutional amendment so that the city could not pave a street unless the whole or most of it were paid out of the general fund. The paving of Olive-st. with asphalt put the city out of the paving business for several years, because it had no money. When the fair was proposed the city was in fearful condition. It took two-thirds of the vote to amend the constitution. The united efforts of all the papers, the fair directors, both political parties were all required to change the constitution, but it was done. Repaving, resurfacing, everything is now against the property. The limit of taxation was fixed so that St. Louis could get about $12,000,000 besides.

They postponed the fair a year to enable them to make the city presentable. Hundreds of miles of pavements will have to be laid, it is estimated, to accomplish it. Now, why all this? Was it not

because when the live, progressive men who had built up the city lost interest in it by closer attention to their own affairs, little by little the city began to slip back, and before they realized it the city was on the back track, and there was no help for it except by radical effort?

ORGANIZATIONS AND INDIVIDUALS

Technical Meetings—Personal Notes.

Technical Meetings.

The board of directors of the Engineering association of the South met December 8 for the purpose of organizing for the ensuing year. G. M. Ingram, W. H. Shuerman and Robert L. Lund were appointed an executive committee, with power to act for the directors between meetings.

The twenty-fifth anniversary of the Engineer's club of Philadelphia was celebrated Dec. 6 by the club at a dinner held in the banquet hall of the Union league. Nearly three hundred attended the dinner, including representatives of a number of other engineering societies and engineers from other cities.

At a joint meeting of the Rochester Academy of Medicine and the Rochester Engineering society, Rochester, N. Y., Nov. 26, papers were submitted as follows: "The Domestic Water Supply of Rochester," E. A. Fisher, city engineer of Rochester; "Sanitary Protection of the Sources of Our Water Supply," J. Y. McClintock; "Chemical Analysis of Our Drinking Water," Fred E. R. Elinger, chemist, health department.

The seventh annual convention of the State Commissioners and Supervisors convened in Beatrice, Neb., Dec. 2. Among the recommendations made by the committee on legislation is one that laws governing the construction of bridges be so amended that boards may purchase materials and construct bridges or build them as to them seems best, instead of having to let the contract by the foot, as under the present system. Also, that cities be given, under certain conditions, jurisdiction over the public highways leading to them a distance of six miles beyond the corporate limits of said city, and to vote taxes for the purpose of macadamizing them; to so amend the road law so as to do away with special commissioners and appraisers in laying out new roads, and to give boards power to do the work and to shorten the time in which the same may be done. The association adjourned to meet in Omaha Jan. 20, when the proposed laws will be presented to the legislature.

The fifth annual convention of the League of California Municipalities was held at San Jose Dec. 10-12, 1902. Among the subjects discussed were various legislative measures, regarding uniformity in municipal accounting and reports, disposal of franchises, direct nomination of candidates for office. Papers on sewage disposal, street lighting specifications, street cleaning and garbage disposal, and municipal ownership were also on the program.

At its meeting of Dec. 10 the New England Water Works Association discussed papers on "The Relation of Water Works Engineers to the Fire Service of Factories," by Edward Atkinson. On Practical and Theoretical Precision in Every Day Life," by William B. Sherman and on "How I Reduce Pressure on a Gravity System," by E. H. Gowing.

The next annua meeting of the National Good Roads association will be held in St. Louis, April 26, 1903. R. W. Richardson, secretary, Chicago, Ill.

The Wisconsin Clayworkers' association will hold its third annual convention at Green Bay, Wis., Jan 27 to 29, 1903.

The sixth annual convention of the Ohio Municipal league will be held at Hamilton, O., Feb. 10, 11 and 12, 1903.

The seventeenth annual convention of the National Brick Manufacturers' association will be held at Boston, Mass., Feb. 4 to 7. The Ceramic society will meet on Feb. 2 and at the same place.

The twenty-fifth annual convention of the Illinois Clayworkers' association will be held at Bloomington, Jan. 6 and 7, 1903.

The next annual meeting of the Michigan Engineering society will be held at Battle Creek, Mich., Jan. 20, 21 and 22, 1903. F. Hodgman, sec'y, Climax, Mich.

The next convention of the Indiana Engineering Society will be held at Indianapolis Jan. 15-17, 1903. This society is extending its field to cover all branches of engineering and is rapidly increasing its membership. The program includes the following subjects as shown by a preliminary statement which has been sent out:

The city engineer of the small city, River pollution, Bituminous macadam pavement, A proposed new law regulating surveying, The sewer system of Lebanon, Regulation of town plats and additions, Monuments, Coal-dust burning plant, A sand filtration plant, A report on interurban railways in the state, A report on materials of construction, Better economy in highway bridges, Earthwork in railroad construction, Two papers upon mechanical engineering, Concrete, Value of manual training for engineers.

Personal Notes.

Capt. Evan P. Howell has been elected mayor at Atlanta, Ga.

Joseph N. Peterson has been elected mayor at Salem, Mass.

Charles E. Howe has been elected mayor at Lowell, Mass.

Julian Kendrick has been re-elected city engineer at Birmingham, Ala.

Alphonso Tarr has been appointed water commissioner at Gloucester, Mass.

Charles Hood has resigned as superintendent of water works at Burlington, Ia.

The Hon. Oliver M. Gwynn, mayor at Oakland, Ill., died Dec. 10, of typhoid fever.

William M. Bull, assistant city engineer at Oneida, N. Y., died Dec. 5, aged sixty-three years.

Levi Stevens, who devised a water gas process, died at New Castle, Pa., Dec. 4, aged seventy-nine years.

Michael B. Corriden has tendered his resignation as superintendent of water works at Logansport, Ind.

Louis F. Barton has been appointed a member of the board of water commissioners at Newburyport, Mass.

Capt. A. P. Adrian, Wilmington, N. C., has resigned as county surveyor of New Hanover county.

Edward De V. Tompkins has been appointed assistant engineer in the department of bridges, New York City.

Francis D. H. Lawlor, M. Am. Soc. C. E., has been appointed superintendent of water works at Burlington, Ia.

John G. Myers, architect and manufacturer of artificial stone, died in Washington, D. C., recently, aged seventy-two years.

Hon. John R. Rison has been elected mayor of Paris, Tenn., to fill out the unexpired term of Hon. J. L. Lemonds, deceased.

Michael A. Downing has been re-appointed member of the Park Board at Indianapolis, Ind., for the ensuing four years.

Fred Snyder has resigned as city engineer at Williamsport, Pa., to become assistant to Carrol P. Bassett, M. Am. Soc. C. E.

Thomas Murray has been re-elected city engineer, John E. Moore, city electrician, and Henry Nagel street commissioner at Davenport, Ia.

Frank W. Wood, 188 E. Forty-first-st., Chicago, has accepted a position as superintendent of the Crimora Manganese Co., Crimora, Va., where he is located.

Charles D. Benjamin has been re-elected fire chief at South Orange, N. J., with George Schmidt as first assistant and DeWitt Smith as second assistant.

Prof. William Boughton of Denison University, Granville, O., has been appointed professor of civil engineering in the West Virginia University at Morgantown, W. Va.

Eugene Hughes, a member of the contracting firm of Hughes Bros. & Bangs, Syracuse, N. Y., died suddenly Dec. 19 at the Niagara Hotel, Buffalo, N. Y., aged forty-five years.

Prof. I. J. Macomber, professor of Electrical Engineering at the Armour Institure, Chicago, has resigned to accept a position with the Westinghouse, Church, Kerr Co. of New York.

The Hon. Meredith P. Snyder was re-elected mayor, Dec. 1, at Los Angeles, Cal. Harry F. Stafford was also re-elected city engineer; Harry J. Leland city clerk, and E. R. Werdin street superintendent.

J. Granberry Jackson, C. E., and J. A. Omberg, jr., city engineer at Memphis, Tenn., have formed a partnership under the firm name of Jackson & Omberg, and will practice as consulting engineers with offices in the Randolph building.

A. W. Truedson, who has served as city clerk at Galesburg, Ill., for ten years, has presented his resignation, to take effect Jan. 1. He wil be succeeded by Roy Hopcraft, who has served as deputy city clerk for ten years.

Major J. H. Alexander, ex-mayor of Augusta, Ga., died Dec. 4. While in office Maj. Alexander inaugurated many public improvements, the most important of which was the splendid water works system which that city possesses.

J. W. Peterson has been elected president of the Electrical Equipment Company of Chicago, to succeed J. Holt Gates, who resigned and will hereafter conduct a contracting business under the firm name of J. Holt Gates & Co., with offices at 927 Monadnock block, Chicago.

Prof. Edward Orton of the Ohio State university delivered a lecture before the students of the University of Wisconsin, Dec. 20, in which he said that the United States had grown from an insignificant position among the cement-producing countries to the second largest producer in the world.

F. B. Aldrich has resigned as general manager of the Wyandotte Gas Company at South Bethlehem, Pa., to become general manager of the Pottsville Gas Company, Schuylkill Haven Gas and Water Company, Schuylkill County Gas Company, Bath, N. Y.; Electric and Gas Com-

pany, Easton, Md.; Gas, Light and Fuel Company, and Easton Electric Light Company, Easton, Md.

Burton J. Ashley, commercial and consulting engineer of Chicago, Ill., who recently resigned as chief engineer in founding Zion City, Ill., has established an office at 523 The Temple, Chicago. He will devote his time largely to the examination and reports on public and private utilities and in assisting in launching and developing factory and town sites and colonies. Mr. Ashley calls our attention to the fact that he is a member of the American Society of Municipal Improvements, but not of the American Society of Civil Engineers, as stated last month.

Prof. Edward R. Cary, city engineer at Troy, N. Y., was removed from office Dec. 18 by Mayor Conway. An editorial comment of the Troy Daily Times of Dec. 19, states that the people's amazement, when they learned that he had been summarily removed from office by Mayor Conway, was changed to indignation when it was learned that there were no charges against him, but that he was removed because he refused to permit himself to be used to advance an apparent purpose to cripple certain city departments under the pretense of reform.

Ira Merchant, C. E., Bloomington, Ill., died Nov. 27, aged sixty-five years. Mr. Merchant was appointed city engineer of Bloomington in 1869 and held that office eleven years. When appointed the city had no pavements, sidewalks, sewers or water works. During the years he was city engineer he planned and superintended all public improvements and was engineer and superintendent of that city's water works system. When he took charge of the office the city had no records, but during his incumbency he arranged the records of the office and systematized the work in such a manner that few, if any, additions have since been made.

Mr. Richard D. Gottleib, secretary and chief engineer of the General Supply and Construction Company, 8 and 10 Bridge-st., New York, sails Monday, Dec. 15, on the S. S. Deutschland. Mr. Gottleib expects to be absent four or five weeks. While abroad he will visit the offices of his company in Manchester, Paris and Antwerp, but most of his time will be spent at the steel mills in Germany, for which they are the American representatives both for rails and structural material

President C. H. Rust of the American Society of Municipal Improvements has appointed a special committee on "Municipal Data and Statistics" consisting of Charles Carroll Brown, Indianapolis, chairman; J. W. Howard, New York, and F. W. Cappelen, Minneapolis. This is the same membership that the committee had in 1902.

Dr. Cady Staley, who has retired from the presidency of the Case School of Applied Science, at Cleveland, O., after ten years of service, has gone abroad, where he expects to remain for several years.

Andrew Rinker, formerly city engineer of Minneapolis, Minn., after several years in Montana, has returned to his former city of residence.

F. G. Street, 36 Lasalle-st., Chicago, Ill., has been appointed sole agent for northern Illinois, Indiana, Michigan, Minnesota, Wisconsin, North and South Dakota and Kansas for the Scaife and We-Fu-Go water softening and purifying systems. Mr. Street is known throughout the territory he will handle, in manufacturing and engineering circles, and has given the subject of water purification considerable attention, and is in a position to furnish complete information on this subject.

Mayor W. E. Smallfield of Renfrew, Canada, has prepared a booklet for circulation among the voters of the town and elsewhere, showing in brief the official history of the town since its incorporation in 1894, and statements of the financial operation of the water works and sewer systems and their extension, and the construction of concrete walks and macadam, which shows very satisfactory conditions and that the town is progressive and gaining steadily in population, now having more than 3,200 inhabitants. Mr. Smallfield is finishing his second year as mayor.

MACHINERY AND TRADE

A New Paving Brick Plant at St. Louis

The first product of the St. Louis Clay Burning Company, a plant recently erected, made its appearance in St. Louis about the 1st of December, and it has been so favorably received that they now have orders which will insure the operation of the plant throughout the entire winter.

This company is situated about six miles from the city limits and has beds of shale coal and fire clay in abundance. The plant is equipped throughout with Chambers machinery. They use an A. B. C. blower and use waste heat for drying purposes. They have four of Bushongs's patent down draft kilns and the plant is now being operated under the superintendence of Mr. Bushong. Their prospects for next season are very bright and success in the new venture seems certain.

A New We-Fu-Go Water Softening Plant.

The Salem Iron Company, Leetonia, O., have contracted with Wm. B. Scaife & Sons Company, Pittsburg, Pa., for a 2,500 H. P. We-Fu-Go Water Softening and Purifying system. The Salem Iron Company have tried several methods of water purification without success, and after going into the matter very carefully have decided that the We-Fu-Go system will meet their requirements. Among some of the other recent contracts which Wm. B. Scaife & Sons Company have closed for both the Scaife and We-Fu-Go systems are the following: Pittsburg Plate Glass Company, Elwood, Ind., 2,500 H. P.; Rochester & Pittsburg Coal & Iron Company, Dubois, Pa., 2,500 H. P.; Toledo Furnace Company, Toledo, O., 4,000 H. P.; Buffalo & Susquehanna Iron Company, Buffalo, N. Y., 6,000 H. P.; Edward E. Rieck Company, Pittsburg, Pa., 500 H. P.; Pennsylvania Salt Manufacturing Company, Wyandotte, Mich., 1,700 H. P.

A High Grade Cement.

In the average of cement tests for 1901 made by the testing laboratory of the department of public works of Philadelphia, Whitehall cement stood highest in the sand tests for four months' time, proportions one to three. The details of the results for all the cements tested are given in a slip issued by the Whitehall Portland Cement Company as well as in the official reports of the department. The merits of the cement, the works at which it is made, some of the structures in which it has been used, and the opinions of its uses are set forth and illustrated in a handsome book which our readers can obtain from the office of the company at 1404 S. Penn-square, Philadelphia, Pa.

An American Filter Plant in India.

The New York Continental Jewell Filtration Company report that they have closed the contract with the Maharaja of Mysore, India, through Capt. A. J. de Lotbiniere, Royal Engineers, English army, who was sent from India to New York by his government for that purpose. The filter plant is to consist of four Jewell Gravity Filters each twenty feet in diameter constructed of granite laid in Portland cement. There will be a masonry subsidence basin holding 400,000 imperial gallons. The capacity of the filter plant is to be 2,600,000 United States gallons. It will be erected early in the spring by one of the Filter Company's engineers. It is to be located at Bowringpet in the Kolar gold fields near Gangalore, Mysore, Mr. E. B. Weston, M. Am., Soc. C. E., is consulting engineer.

Some Large Water Filter and Softening Plants.

The Pittsburg Filter Manufacturing company, Empire building, Pittsburg, Pa., has had an unusually busy year installing water works filters and water softening plants. Besides having constructed what they claim is the largest water softening plant in the world, of 2,500,000 gallons capacity, for the Tennessee Coal, Iron and Railway company, Birmingham, Ala., they have installed the following additional plants: Colorado Fuel and Iron company, Pueblo, Col., 7,500 horse power; Indianapolis Water company, Indianapolis, Ind., 3,000 horse power; Cleveland Furnace company, Cleveland, O., 6,000 horse power; Morey-LaRue Laundry company, Elizabeth, N. J., 1,500 horse power; Laflin & Rand Powder company, Pompton Lakes, N. J., 1,000 horse power; Hidalgo Mining company, Parrall, Mex., 500 horse power;

Cleveland & East Bethany, N. Y. (each), 300,000 gallons daily; Keokuk Cereal company, Keokuk, Ia., 600,000 gallons daily; Sharon Water Works company, Sharon, Pa., 2,000,000 gallons daily; Waynesburg Water company, Waynesburg, Pa., 1,000,000 gallons daily; Columbia Water company, Columbia, Pa., 2,000,000 gallons daily; Upper Sandusky Water company, Upper Sandusky, O., 1,000,000 gallons daily; United States Zinc company, New York, 600,000 gallons daily.

American Structural Steel at Home and Abroad.

The General Supply and Construction Company, Inc., have recently taken among others the following contracts for structural steel work: The annex to new St. Charles hotel, New Orleans, La.; Royal Bank of Canada, and Carrera building, Havana, Cuba; power house, Worcester, Mass.; Wharf building and shed, Bostorf, Mass.; hotel building, Johannesburg, South Africa, including in all about 7,000 tons.

This company has also recently been appointed engineers and contractors for the Carlton hotel syndicate, London, Eng., and will have charge of the engineering and erection of the hotels for this syndicate at Johannesberg, South Africa; Capetown, South Africa, London, England, and Brussels, Belgrum.

Trade Publications.

The American Arch and Culvert Company of Toledo, O., show the appearance of various forms of their patent steel-centered concrete arches in a small circular.

"Useful Information for Road Officials" is the title of a little pocket book with leaves for advertising the bridge and culvert business of J. H. Burnham, Bloomington, Ill. It illustrates steel bridges and concrete culverts.

Among recent leaflets setting forth the advantages of Warren Bituminous Macadam Waterproof Pavements are extracts from the Morristown (Pa.) Times and the Harrisburg (Pa.) Independent.

"The United States Gypsum Company's Reference Atlas of the World" is the most elaborate trade publication received for some time. It is an atlas of ninety-six pages with six pages of advertising matter giving the names of the brands of plaster made by the company and a statement of their qualities. The office of the company is 184 LaSalle-st., Chicago, Ill.

Trade Notes.

ASPHALT.

The Ravia Asphalt Company is being organized in St. Louis, Mo., to mine asphalt and sell it in a crude or refined form. Joseph L. Hanley, Frank H. Hamilton, Louis Burmeister and George A. Mills are interested.

The F. D. Cummer & Son Company of Cleveland, O., has furnished one of its Cummer semi-portable asphalt paving plants to the Marion County Construction Company at Indianapolis. The plant is now being built.

The American Standard Asphalt Company, composed of Louisville and southern Kentucky people, is considering three propositions for the sale of 557 acres of asphalt land in Logan county.

BRICK.

The St. Louis Vitrified and Fire Brick Company, St. Louis, Mo., has increased its capital stock from $100,000 to $135,000.

James M. McBurnett of Wedowee, Ala., has secured option on 10,000 acres of kaolin and mica lands in north Randolph county, near the Pinetucky gold mines. The kaolin is said to be thoroughly adapted for the manufacture of vitrified and fireproof brick and various other purposes.

The Diamond Brick and Tile Company, Kansas City, Mo., sold its plant, Dec. 13 to the Kansas City Hydraulic Press Brick Company, which will continue to operate the plant for the manufacture of diamond vitrified brick.

CEMENT.

Tests are being made of the deposit of marl in Mink Lake, near Eganville, Canada, to ascertain its qualities for making cement.

All of the cement factories in Rhineland and Westphalia have entered into a combination, according to the Hanover Courier of Dec. 17. The principal object is to fix prices, which will start at from 175 to 180 marks per 10,000 kilos gross.

A plant is being established at Riverside, Mineral county, W. Va., for the manufacture of Portland and common cement by M. S. and Ernest R. Ackerman of Plainfield, N. J., and others in the cement plant at Cumberland, Md. Over $400,000 will be expended in building the plant.

The Manitoba Cement Company contemplates erecting a cement plant at Winnipeg or Morden, Man., and will also manufacture brick and tile. J. A. Hunter of Winnipeg, is manager.

G. S. N., Rochester, N. Y., desires to correspond with cement manufacturing firms with a view to establishing a sales agency for the disposal of their product, together with the necessary accessories thereto, such as tile, sewer pipe, etc. He would also like to be put in touch with a southern town or city where a man of experience in the cement business is desired in starting cement work in all its various phases. Letters in care of the office of this magazine will be forwarded to him.

The Superior Cement Company is erecting twenty-six kilns at their new plant at Martins Creek, N. J. The Alpha Cement Company, which recently purchased the Krause plant at Martins Creek, is building eight new kilns.

Options have been taken on the farms

of Theodore Hopler, Thomas M. Boyer and George Boyer of Oxford township, Warren county, N. J., by Jacob V. Carter of Belvidere, acting for Nazareth capitalists. The tract covers over 400 acres and is rich in cement deposits. Tests will be made, after which a large plant will be erected along the Lackawanna railroad. Work has begun on the Hildebrant form near Belvidere, and it is stated that considerable cement rock is located there.

LIGHTING.

The Western Street Lighting Company, of West Virginia, has been granted permission to locate in Cleveland, O. Chas. P. Hine, agent.

The Westinghouse Electric Company, of Pittsburg, Pa., contemplates opening a plant in Ottawa, Canada, about Feb. 1 for the preparation of mica for electrical purposes.

The Walther Lighting and Heating Company, manufacturers of gasoline lighting machines and hot air heating plants at Davenport, Ia., will start in business Jan. 15 at 414 and 416 W. Third st. Henry Dunker, president.

The Reynolds Electric Company of Chicago has changed its name to the Reynolds Electric Flasher Mfg. Co.

The Independent Incandescent Lamp Co., St. Louis, Mo., has been incorporated by Henry M. Coudrey, Walter M. Gilliam, Walter Ennes, James A. Carr and B. G. Tremaine.

The Modern Light, Heat and Power Co., Indianapolis, Ind., has been incorporated to manufacture an acetylene burner, by C. A. Johnson, Leo Lando, Frank E. Wolcott, Leroy Templeton, Albert Krull and Malinda Krull

The Bellaire Electric Company, which has an electric supply house at Bellaire, O., has been incorporated under West Virginia laws and will establish a larger business of the same kind at Wheeling, W. Va. The incorporators are H. S. Hesse, A. Armstrong, of Wheeling; J. W. Corbett, W. L. Armstrong and W. A. L. Smith, of Bellaire.

Newly incorporated lighting companies: Brooklyn Lighting and Heating Co., Brooklyn, Ia.; Massena Electric Light and Power Co., Massena, N. Y.; Northwestern Heat, Light and Power Co., Milwaukee, Wis.; Electric Light Co., Cincinnati, O.; Witzles Electric Light Co., Perrysburg, O.

MISCELLANEOUS.

O. Johnson, manufacturer of Portland cement sidewalks, at Brookings, S. D., has purchased a machine of the Harmon S. Palmer Hollow Concrete Building Block Company, Washington, D. C.

The Michigan City Traction company, Michigan City, Ind., has been incorporated by Russell B. Harrison, Jeremiah B. Collins, Minrad A. Schutt and Samuel G. Boyd.

William H. Gillin of Milwaukee was awarded the contract Dec. 19 for tearing out the old north harbor pier and the present breakwater and replacing them with concrete structures for $202,430.

The Carolina Steel Bridge Construction Company, Burlington, S. C., has been incorporated by H. M. Brady of Chattanooga, Tenn., and G. W. Anthony and J. B. Thomas of Burlington.

H. S. Trestrail, president of the Trestrail Paving and Sidewalk Company of Kansas City, Mo., contemplates establishing another paving plant at St. Joseph, Mo.

The Freedom and Monaca Bridge Company and the Ohio Bridge Company have merged and consolidated under the name of Ohio River Bridges Company. Henry Cooper, Bellevue, Pa., treasurer. Directors—Andrew J. Jolly, John J. Allen, Monaca, Pa.; John J. Homan, Henry M. Camp, Joseph C. Campbell, Rochester, Pa.; Henry Cooper, Bellevue; Albert M. Jolly, Beaver Falls.

The Roman Stone Company, Toronto, Ontario, is building a plant for the manufacture of artificial stone.

The Herbst Drain Tile Company, Herbst, Ind., has been incorporated by John Prior, John B. Reed and John W. and Clifford Rust.

The Vandergrift Construction company, of Philadelphia, has been granted franchises for developing water power and building an electric road at San Juan, Porto Rico.

The Altoona Foundry and Machine Company, Altoona, Pa., increased its capital stock, Dec. 1, from $35,000 to $100,000. The company contemplates doubling the size of its plant.

The Washington Pipe and Foundry Company, which has absorbed the Soderman Pipe Company, of Tacoma, Wash., is erecting a plant in that city for manufacturing wooden water pipe. H. Orchard, gen. mgr.

The Standard Underground Cable Company has begun the manufacture of wire at its plant in Perth Amboy, N. J., Pittsburg, Pa., and Oakland, Cal.

The Great Eastern Clay Manufacturing Company, South River, N. J., has been incorporated and will erect a plant to manufacture vitrified conduits and like products. The incorporators are T. J. Taber, R. M. Syee, J. A. Green, B. S. Barbard and W. A. Snow.

The Buffalo Pitts Company, Buffalo, N. Y., is installing electric power, supplementary to the steam power already in use, both in the foundry and the main shops.

The Austin-Western Manufacturing Company, Ltd., Chicago, Ill., has recently erected a $6,500 Austin crushing plant for Freeport, Ill.

SEWER PIPE.

A plant will be established at Sault Ste. Marie, Mich., by W. S. Fillmore of Gaylord, Mich., for the manufacture of cement brick and sewer pipe.

The new plant of the Southern Sewer Pipe Company of Birmingham, Ala., will be in operation by January, 1903.

The city council of Winnipeg, Man., contemplates installing a plant for the manufacture of sewer pipe.

WATER.

The United States Land Filtration Company, a New Jersey corporation, has been given a charter under Indiana laws. Lewis K. Davis, Indianapolis, agent.

Recent Inventions.

711,328. Oct. 14, 1902. Sand drier. George Merriman and Herman Merriman, Toledo, O., assignors to the Toledo Patcher Company, comprising a furnace, a drum with open ends, a wet sand chute, a hot sand chute, a fan and engine for operating, and means within the drum for advancing the sand from end to end.

711,365. Oct. 14, 1902. Wheeled scraper. J. C. Stubbs, Mt. Pleasant, Ia., assignor to Warren Beckwith, same city. Combination with the arched axle and carrying wheels, the Johnson bar secured on the bends of the axle, and the gear suspended from the overhanging end of the Johnson bar, of a pair of levers and draft beams, and links connecting the levers with the Johnson bar at joints in rear of the latter's connection with the axle.

711,521. Oct. 21, 1902. Indicating device for filters, water works, etc. C. L. Parmelee, Orange, N. J. Indicating device mounted on two rotable devices, pulleys, two trains of reducing gears, two followers, means for transmitting the followers to the pulleys, and an electrical alarm.

711,683. Oct. 21, 1902. Street sweeper. W. S. Thorp, Philadelphia, Pa., assignor to the Improved Sweeper and Lifter Company, same city. A hollow wheel to receive sweepings, a broom to force sweepings toward the wheel, an elevator in front of the broom adapted to force the sweepings into the interior of the wheel.

711,713. Oct. 21, 1902. Burial vault. Gilbert Boiser, Indianapolis, Ind. A vault formed of cement sections with cement bottom pieces, loops extending up from the bottom pieces, whereby a support for the casket above the bottom will be provided.

711,804. Oct. 21, 1902. Pump for deep wells. A. J. Webster, M. W. Hall and W. E. Stadler, Bakersfield, Cal.

711,895. Oct. 21, 1902. Push wagon for street cleaning purposes. Thomas Hill, Jersey City, N. J. In a wagon the wheels, handle, sides and platform combined with the oppositely arranged frames having the curved facing horizontal toothed members and vertical leg members, the latter held by the sides of the wagon.

711,933. Oct. 28, 1902. Elevator. Volney W. Mason, jr., New York City. Buckets carried by endless chains, with roll-engaging portions along the outer edges of the buckets, combined with a pair of rolls and a support for holding them in position.

712,073. Oct. 28, 1902. Press for making building or paving blocks from plaster materials. J. A. Joyce, Cleveland, O.

712,076. Oct. 28, 1902. Blue-printing machine. S. L. G. Knox and W. O. Wakefield, Schenectady, N. Y.

712,170. Oct. 28, 1902. Garbage can. W. S. Young, Chicago, Ill. Comprising a cylindrical metal body sheathed with a number of wooden staves covering the entire exterior surface.

712,193. Oct. 28, 1902. Roof. F. L. Kane New York City. A roof with base and tiles of bituminous material and united with bituminous cement.

712,308. Oct. 28, 1902. Method of laying roofs. F. L. Kane, New York City. Forming a base of bituminous material, then applying a layer of bituminous material in the form of individual elements and uniting the layers by the use of a solvent oil.

712,315. Oct. 28, 1902. Street cleaning apparatus. D. I. Langworthy, Syracuse, N. Y. Combining with the supporting wheels and a brush on the frame, a receptacle pivotally mounted on the frame and provided with a scraper and means for rocking the receptacle and varying the position of the scraper.

712,397. Oct. 28, 1902. Photometer. C. P. Matthews, Lafayette, Ind., assignor to L. B. Marks, New York City. An apparatus for measuring candle-power, combining a photometer screen, supports for sources of light and devices for receiving and directing the light from the sources of the screen.

712,541. Nov. 4, 1902. Roadway. W. E. Jacques, Grand Rapids, Mich., assignor to A. O. Crozier, Grand Rapids, Mich. In a roadway a track for a vehicle wheel composed of artificial stone and provided with a path.

712,572. Nov. 4, 1902. Dump car. T. R. McKnight and H. A. Clapp, Aurora, Ill., assignors to Western Wheeled Scraper Company, Aurora, Ill.

712,625. Nov. 4, 1902. Steel concrete construction. Carl Weber, St. Louis, Mo. A series of intersecting T beams, a clamp at their intersection enveloping the web and flange of one beam, and having wings spanning the flange of the adjacent beam and extensions enveloping the edge of the flange.

712,559. Nov. 4, 1902. Test trap or seal for sewer pipes. C. M. Brun, New York, assignor of one-half to W. F. Prendergast, New York.

712,841. Nov. 4, 1902. Process of building concrete and masonry structure. W. C. Parmley, Cleveland, O. The process of building arch structures consisting in constructing the foundations with metallic bars imbedded and projecting above the surface, providing centering for the arch, attaching transverse bars, covering the centering with a layer of paraffine paper and imbedding the transverse bars with mortar.

713,024. Nov. 4, 1902. Furnace for the destruction of town refuse. George Watson, Leeds, England. Combining a cover for the charging opening, rocking arms and pivotal supports, and a trough surrounding the opening containing the liquid for sealing the cover when closed and receiving the cover when open.

713,077. Nov. 11, 1902. Sewer cleaner. Louis Dubois, Montreal, Canada. Comprising a skeleton frame having scraper blades arranged in contact with each other.

713,117. Nov. 11, 1902. Hose-pipe connection. G. S. Lee, Hawthorne, N. J. A nipple with hose-expanding portion and groove at the rear adapted to fit into a socket having spring tongues.

713,164. Nov. 11, 1902. Method of placing piles. Charles Sooysmith, New York City. Sinking a tube into the ground, forcing a pile through the tube, then withdrawing the tube.

713,165. Nov. 11, 1902. Method of solidifying and excavating the soil and constructing tunnels. Charles Sooysmith, New York City. Solidifying the area over and at the sides of the proposed excavation by means of a number of pipes into which a cold medium is introduced.

713,173. Nov. 11, 1902. Mold for concrete walls. H. A. Taylor, Jackson, Mich., assignor of one-half to G. M. Stanley, same city.

713,466. Nov. 11, 1902. Cut-off for drain pipes. F. J. Louis, Belleville, Ill. Comprising sections provided at their meeting edges with grooves having discharge openings.

713,519. Nov. 11, 1902. Method of building tunnels, shafts, etc. Charles Sooysmith, New York City.

713,521. Nov. 11, 1902. Tunnel. Charles Sooysmith, New York City. A tunnel supported upon and secured to piles and having a pilot tunnel containing a freezing agent.

713,630. Nov. 18, 1902. Apparatus for impregnating wood. Tomaso Giussani, Milan, Italy. Impregnating railway sleepers by automatic action with liquids contained in successive vats, the timbers being transferred from one vat to another by means of endless chains.

713,684. Nov. 18, 1902. Construction of bridges. Hermann Prinzhorn, Halle-on-the-Saale, Germany. The combination of suspension cables and cantilever trusses, towers and piers, and suspenders connecting the cables and trusses.

713,742. Nov. 18, 1902. Contact-shoe for electric railway. W. M. Brown, Johnstown, Pa., assignor to the Lorain Steel company. Combination of a carrier and continuous contact-strip, separate cushion members interposed, car-plates and securing devices.

713,750. Nov. 18, 1902. Excavating machine. Walter Cole, San Francisco. A machine for cutting narrow ditches or trenches, comprising a wheel carrying a number of excavating buckets, a rotary ditch-trimmer suspended from the rear of the frame, means for imparting forward motion to the frame and rotation to the excavating wheel, and means of operating the trimmer during the working of the wheel.

713,896. Nov. 18, 1902. System of purifying municipal water supplies. Prosper Maignen, Philadelphia, Pa. Conduits connecting a setting basin, a scrubber and a granular bed filter, so arranged that the water will be discharged from the basin to the filter through the scrubber, which contains a mass of impedimentors, having interstices of such size as to permit the free passage of the water.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

St. Joseph Mo.—City Engineer Floyd secured samples of paving brick from manufacturers throughout the Missouri valley and submitted them Dec. 23 to the streets, alleys and grades committee of the municipal assembly.

Alexandria, Va.—An ordinance was adopted Dec. 9 making it unlawful for any railroad company or any employe of such company to obstruct street improvements, also making it a misdemeanor for any railroad company to fail to pave between its tracks and two feet on each side of them as required by law.

CONTEMPLATED WORK.

Delphos, O.—Paving is contemplated for Main-st.

Fond Du Lac, Wis.—Paving is contemplated for Main-st.

Brookfield, Mo.—Paving is proposed for Main-st. Mayor Bowden.

Beaumont, Tex.—The question of brick street paving is being urged.

Ludington, Mich.—This city voted to issue $20,000 street improvement bonds.

Adams, Or.—The citizens are in favor of constructing improved sidewalks.

Dallas, Tex.—Paving is proposed for Akard-st. from Commerce-st. to Ross-ave.

Springfield, Mich.—The question of macadamizing Michigan-ave. is being considered.

Toledo, O.—A resolution has been passed to pave John-st., from Canton to Union.

Great Falls, Mont.—The question of repaving Central-ave. is being discussed.

Philadelphia, Pa.—A boulevard from the city hall to Fairmount park is contemplated.

Salt Lake City, Utah—Paving is proposed for Brigham-st., from State to Tenth.

Normal, Ill.—An ordinance was passed Dec. 22 to pave Fell-ave. with asphalt.

Hartford, Ind.—Brick paving is proposed for Washington-st. Cy. Engr. Harley.

Traverse City, Mich.—Plans to pave Sixth-st. with brick or asphalt are being made.

Vallsburg, N. J.—Objections to the proposed improvement of Fourteenth-st. will be heard Jan. 7.

Knoxville, Tenn.—This county has voted to appropriate $100 for the improvement of the roads.

Los Angeles, Cal.—An ordinance has been passed for paving Broadway-st., from Second to Sixth.

Buffalo, N. Y.—Francis Ward, comr. pub. wks., urges the question of repaving Tifft-st.

Almonte, Ont.—The question of raising $5,000 for cement walks will probably be voted on.

Findlay, O.—A petition is being circulated asking that W. Cranford-st. be paved with brick.

Ft. Smith, Ark.—A contract will be let during January for 100,000 brick to repair Garrison-ave.

Springfield, Ill.—Petitions for paving Carpenter-st., from Sixth-st. to Walnut-st., are being circulated.

Oklahoma City, Okla.—A petition is being circulated asking that E. Reno-st. be paved with asphalt.

Oberlin, O.—Petitions are being circulated asking that S. Cedar-ave., S. Main-st. and N. Main-st. be paved.

Marinette, Wis.—Vine-st. will be paved with brick and a number of streets macadamized next season.

Ilion, N. Y.—The city contemplates constructing 1 4-7 miles of brick paving in Main-st. next season.

Millville, N. J.—An ordinance has been introduced providing for the paving of the principal streets.

Woodstock, Ill.—Vitrified brick paving is contemplated for Dundas-st., according to press reports.

New Castle, Ind.—The residents of S. Main-st. have petitioned for paving and brick will probably be used.

Manley, N. C.—W. O. Ruggles and associates will establish a health resort and construct improved streets.

Joliet, Ill.—A petition has been submitted to the board of local improvements asking that certain alleys be paved.

Pasadena, Cal.—The streets and alleys commissioner has recommended the construction of cement walks on Walnut-st and Fair Oak-ave.

Bridgeport, Conn.—The committee on streets and sidewalks is considering the matter of paving Barnum-ave. and Broad-st.

Brooklyn, N. Y.—A large list of streets will be repaved next year with asphalt Medina sandstone and asphalt block.

Cairo, Ill.—Ordinances have been adopted for building brick walks on Center-st. between Washington and Walnut.

Jacksonville, Fla.—The question of paving San Marco-ave., with vitrified brick is again being discussed.

Red Oak, Ia.—A resolution was passed Dec. 8 providing for sixteen blocks of paving in the residence district.

Harris, Ont.—The question of issuing $12,000 debentures for cement walks will be voted on Jan. 5.

Hartford, Conn.—City Engineer Ford was directed, Dec. 10, to prepare specifications for new curbing on Pearl-st.

Cohoes, N. Y.—A petition has been presented to the public improvement commission asking that Bevan-st. be paved.

Elgin, Ill.—The property-owners on Grove-ave. and National-st. have petitioned for asphalt paving. A. E. Price, mayor.

New Orleans, La.—The property-owners on Customhouse-st., between Royal and Bourbon, have asked for asphalt paving.

Ventura, Cal.—The question of issuing $5,000 bonds for building sidewalks and cross walks will be voted on Jan. 24.

Burlington, Ia.—Bids will probably be asked about Feb. 1 for 20,000 sq. yds. of brick paving. Emmett Steece, cy. engr.

Helena, Ark.—The cy. engr. will be directed to procure estimates of the cost of paving Cherry-st. with brick and asphalt.

Colorado Springs, Col.—The question of experimenting with crushed oil rock for street paving purposes is being discussed.

Houston, Tex.—A petition has been submitted to the city council asking that the area in front of the fire station be paved.

Birmingham, Ala.—Bids will asked soon for paving a number of streets with vitrified brick, asphalt and bituminous macadam.

St. Paul, Minn.—The city council has appropriated an additional $4,000 for paving the street intersections of Mississippi-st.

Lansing, Mich.—The estimated cost of paving Michigan-ave from the Michigan Central Ry. to Pennsylvania-ave with brick is $13,517.57.

Indianapolis, Ind.—A resolution has been adopted for constructing cement walks on Nineteenth-st. from Central to College-aves.

Beaumont, Tex.—Bids will be received until Jan. 6 for $95,000 paving bonds and $75,000 sewerage bonds. Thomas H. Laugham, mayor.

Sioux City, Ia..Resolutions have been introduced for paving about six and one-half miles of streets with asphalt and brick. Cy Engr. Lewis.

Moline, Ill.—The Business Men's Association is interested in securing paving for Market-square and the improvement of the river road.

Joplin, Mo.—City Engineer Donman has been directed to prepare estimates of the cost of grading and macadamizing Gray-ave. from First to B-sts.

Faribault, Minn.—A committee has been appointed to investigate the matter of paving portions of the principal business streets of this city.

Poplar Bluffs, Mo.—A resolution was adopted Dec. 9 to macadamize, curb and gutter Cedar-st., from Main-st. to Eighth-st. Mayor Abington.

Manchester, Va.—An effort will be made next year to pave and improve all of the streets in this city with granite spal's and concrete walks.

Marshalltown, Ia.—Resolutions were adopted Dec. 10 for paving S. First-ave. N. Fourth, Park and W. Church sts., and Fourth-ave., with brick. Cy. clk. Egermayer.

Belleville, Ill.—The board of public improvements will ask the city attorney to take the necessary legal steps for paving the public square at once.

Elmira, N. Y.—Grand Central-ave. has been selected for the proposed macadam road between Elmira and Horseheads. Charles Chamberlain, chmn. spec. com.

Saginaw, Mich.—Action has been taken to pave seventeen streets during 1903 with bituminous macadam. City Engineer Roberts estimates the cost of proposed work at $200,000.

Beaumont, Tex.—A committee has been appointed to solicit subscriptions from the citizens for paving the principal improved streets with plank. P. A. Heisig, chmn.

Nevada, Mo.—(Special)—The city council has ordered a resolution drafted for about 30,000 sq. yds. of vitrified brick or asphalt paving on Cherry-st. Jas. M. Clark, cy. engr.

Moline, Ill.—The property-owners on Twelfth-ave. are signing a petition for asphalt paving from Fifteenth to Eighth-st. and from Tenth-ave. to the city hospital.

Galesburg, Ill.—The question of paving Holton-st. and Grand-ave. and the extension of the W. Main-st. pavement is being considered. Peter McL. Davidson, supt. sts.

Charlottesville, Va.—About 30,000 sq. yds. of paving is contemplated, for which $80,000 bonds have been voted. Bituminous macadam will probably be the material selected.

Savannah, Ga.—An ordinance has been introduced to pave E. Broad-st., from Jones to Gwinnett, and Henry-st., from Price to Walters road, with vitrified brick.

Muncie, Ind.—The construction of a boulevard around the northern and western sides of the cemetery is contemplated by the Branch Grove cemetery board.

Tacoma, Wash.—Resolutions were adopted Dec. 17 for grading Steele-st., from N. Eighth to N. Twenty-third, constructing wooden curbs, cross walks and cement walks.

Louisville, Ky.—An ordinance for paving the sidewalk on Fifth-st., from Main to Market, with vitrified brick has been referred to the streets committee of the Western district.

Reading, Pa.—The Mt. Penn Speedway and Boulevard Company has applied for a charter to construct a road 3 mis. long from Hessian Camp half way to Mt. Penn. W. A. Witman, prest.

Dallas, Tex.—The property owners on Ross-ave., from the Houston & Texas Central Railway to Fitzhugh-st., are discussing the feasibility of macadem or vitrified brick paving.

Atlanta, Ga.—The property-owners on Peters-st., from Haynes to Walker-sts., have petitioned for asphalt paving and the council will take action on the petition at the first meeting in January.

Cleveland, O.—The county commissioners have passed a resolution, Dec. 11., to pave W. Madison-ave. from Highland-ave. west to the River road, and the county surveyor has been directed to prepare plans and specifications and furnish an estimate of the cost.

Rensselaer, N. Y.—A resolution has been adopted directing the property-owners on Broadway and Third-sts. and Akin-ave. to connect with the sewers and water mains, preliminary to proposed paving. Mayor Lansing.

Springfield, Mass.—The board of park commissioners is considering the matter of extending Court-square pavement, for which work the council recently appropriated $225,000. Chas. H. Sloan, cy. engr.

Binghamton, N. Y.—A proposition has been made to the board of supervisors providing that the portions of those city streets between the city pavement and the good roads lying at the entrance to the city be macadamized.

Duluth, Minn.—A petition is being circulated for paving E. Superior-st., from Third to Eighth-ave., and it is thought that bids will be received in March. Asphalt, macadam and tar macadam are the materials favored.

Richmond, Ind.—City Engineer Weber has been directed to prepare estimates of the cost of paving N. A-st. with cement or asphalt. The same material is also proposed for N. D-st., from Ft. Wayne-ave. to N. Third-st. next spring.

New York City.—Plans have been prepared for the extension of Riverside drive from the Manhattan viaduct to the Boulevard Lafayette. The plans provide for viaducts, terraces, bridges and a public park. President Cantor.

Saginaw, Mich.—The property-owners on Holland-ave., between Genessee and Washington-aves., about two miles, favor bituminous macadam paving, and a resolution has been introduced providing for this material with brick gutters and cement curbs.

Pawtucket, R. I.—Resolutions were passed Dec. 11 appropriating $1,200 for improving Farrell-st.; $3,400 for Anthony-ave. from Main-st. to West-ave.; $1,450 for Columbia-ave. from Francis to Thomas-ave. John J. Fitzgerald, mayor.

Philadelphia, Pa.—Favorable action was taken by the highway committee of councils, Dec. 8, on a number of bills providing for the opening, grading and paving of streets in different sections of this city, principally in the suburban wards.

Cincinnati, O.—A proposition from Warren Bros. Company of Boston, revised to conform with the requirements of Corporation Counsel Hunt, to furnish its patented material to contractors that wish to use it in city street improvements, has been referred to the city engineer.

Seattle, Wash.—Resolutions were adopted Dec. 8 for paving with bituminous macadam, with granite curbing and brick gutters, the following streets: First-ave. from Pike-st. to Denny-way; First-ave. from Denny-way to Harrison-st.; Harrison-st. from First-ave north to Queen Anne-st.

Salisbury, Md.—The committee appointed by Mayor Disharoon, consisting of A. J. Benjamin, W. B. Nuller, T. H. Mitchell and M. V. Brewington, to investigate the cost of paving Main, Dock

and Davidson-sts., will circulate a petition among the property owners. Brick is favored.

New Orleans, La.—The council is considering an ordinance to pave Julia-st. from St. Peters to Magazine with granite blocks removed from St. Charles, Bourbon and other streets to be paved with asphalt. The property owners on Rampart-st. between Tulane-ave. and Julia-st. have petitioned for paving.

St. Joseph, Mo.—Petitions are being circulated for remacadamizing Tenth-st, from Renick to Hickory; macadamize Dewey-ave. from Franklin to Isadore; one to pave with brick and one to macadamize 18th-st. from Francis to Delix; macadamize Louis-st. from Main-st. to Dewey-ave.; macadamize 25th-st. City Engineer Floyd.

CONTRACTS TO BE LET.

Washington, Ia.—Bids are asked for until Jan. 15 for twelve blocks of brick paving, according to press reports.

Burlington, Ia.—Bids will be received until Feb. 1 for about 20,000 sq. yds. of brick paving. Emmett Steece, cy. engr.

Ft. Meyer, Va.—Sealed bids are asked until 10 a. m. Jan. 10 for constructing a macadam road. Capt. W. F. Clark, Q. M.

Cleveland, O.—Sealed bids are asked until Jan. 6 for paving a number of streets with brick. Charles P. Salen, dir. pub. wks.

Rensselaer, Ind.—Sealed bids are asked until 12 m. Jan. 7 for constructing the Hanging Grove twp. gravel road, 34,766 feet. Bd. cmrs.

Fort Collins, Col.—Bids are asked until Jan. 15 for constructing about 20 mls. of road for Larimer county. John E. Ramer, co. clk.

Fond du Lac, Wis.—Bids will be received until Feb. 16 for paving Main and Division-sts. and Forest-ave. with brick. E. B. Parson, cy. engr.

Passaic, N. J.—Bids are asked until Jan. 2 for grading, curbing and guttering Jackson-st. and laying a crosswalk. M. J. Coman, com'r sts.

Cincinnati, O.—Sealed bids are asked until Jan. 6 for paving E. Pearl-st. from E. Front-st. to Martin-st. with granite. Robert Allison, president B. P. W.

Lafayette, Ind.—Sealed bids are asked until Feb. 14 for paving Main-st levee, 6,800 square yards with asphalt with 14,000 square feet of cement sidewalk and 2,500 lineal feet of curb and gutter. Tippecanoe co. com'rs.

Madison, Wis.—Sealed bids will be received until 2 p. m. Jan. 3 for grading, curbing and paving with asphalt Mifflin-st., between Carroll and Pinckney-sts.; Pinckney-st., between Main and Mifflin-sts.; Carroll-st., between Main and Mifflin-sts.; Main-st., between Pinckney and Carroll-sts. O. S. Norsman, cy. clk.

Toledo, O.—Sealed bids are asked until Jan. 5 for paving Eleventh-st. from Washington to Monroe-sts. with vitrified paving blocks. Bids are asked until Jan. 19 for paving Eleventh-st. from Madison to Jackson-sts. with vitrified paving blocks, asphalt, asphalt blocks or vitrified paving brick. Charles H. Nants, cy. clk.

CONTRACTS AWARDED.

Jamestown, N. Y.—The contract for paving Pine-st. with shale paving brick was awarded to Mahoney Bros. & Gardner.

Cincinnati, O.—The contract for macadamizing Glen Parker-ave. was awarded Dec. 15 to O. E. Robinson for $141,612.

Columbus, O.—Baldwin Bros. & Graham secured the contract for paving Pearl alley with Bolen block for $8,588.

St. Joseph, Mo.—Contracts have been awarded to the Phoenix Brick and Contruction Company for paving Thirteenth and Patee-sts. with brick.

Hannibal, Mo.—The contract for paving N. Third-st., between Center and Broadway, has been awarded to J. W. Fielder for $1,700.

Keokuk, Ia.—The contract for paving Fourth, Fifth and Sixth-sts. was awarded Dec. 1 to the Keokuk Construction Company for $7,537.78.

Guthrie, Ok. T.—The contract for paving Oklahoma and Harrison-aves. with vitrified brick was awarded Dec. 11 to George Ford.

Denver, Col.—The contract for building sidewalks in district No. 8 was awarded to J. Fred Roberts at 82 cents a lineal foot.

Cleveland, O.—The Ohio Bituminous Macadam Company of this city has been awarded the contract for paving a number of roads in Cuyahoga county.

Laporte, Ind.—The contract for completing the unfinished roads was awarded to Ralph H. Bertach & Co., of Alexandria for $38,450.

Louisville, Ky.—Henry L. Kremer was awarded the contract for paving four alleys with vitrified blocks at $1.27 a sq. yd. or $5,700.

Philadelphia, Pa.—The American Paving and Construction Company of this city has been awarded a contract for dredging in Eastern Shore rivers.

Baltimore, Md.—The contract for paving Northwest-st. from Fulton-ave. to Payson-st. was awarded, Dec. 10 to Daniel Sullivan for $10,153.

Ft. Worth, Tex.—The contract for paving Houston-st. with brick and asphalt was awarded to the Parker-Washington company for about $60,000.

Louisville, Ky.—The contract for paving parts of Garland and Peterson-aves. with brick was awarded, Dec. 11 to G. W. Gosnell at $1.38 a sq. yd.

Delphi, Ind.—The contract for constructing thirty-two miles of fine gravel road in Burlington and Democrat townships has been awarded to Hillis & Co. of Cass county for $50,000.

Crookston, Minn.—Mayor Hitchcock signed Dec. 11 the contract for the Barber Asphalt Paving Company for paving the business streets of this city with asphalt next spring.

Syracuse, N. Y.—The contract for paving N. Warren-st. from James to W. Willow and W. Willow-st. from N. Salina to Oswego canal, was awarded, Dec. 9 to F. J. Baker.

Newberry, Ind.—The contract for building 15 miles of gravel roads in Stockton twp. was awarded to Chas. O. Morgan

and Amos Musselman of this town for $48,646.

Neshanic Station, N. J.—The contract for macadamizing the road from Woods' tavern to this village was awarded Dec. 18 to Richards & Gaston of Raritan for $36,509.17.

Gloucester City, N. J.—The contract for macadamizing 2,500 sq. yds. of street in the Humbrecht tract was awarded to the Delaware Granite and Mining Company at 55 cts. a sq. yd.

Schenectady, N. Y.—The Schenectady Contracting Company was awarded the contract for grading, curbing and paving Lincoln and South-aves. for $3,665 and Seward-place for $11,855.

East St. Louis, Ill.—The contract for improving Thirteenth-st., from Rockwood-st. to St. Clair-ave., was awarded to Hill and Gaywood, and Bond-ave., from Main to Tenth, to Francis McCabe.

Hartford, Conn.—The contract for paving Pearl-st. with asphalt was awarded Dec. 10 to the Southern New England Paving Company at $2.70 a sq. yd. with ten-year guarantee and $6.60 a sq. yd. for additional concrete required at intersections of street.

Long Island City, N. Y.—Paving contracts have been awarded as follows: Regulating, grading, curbing and flagging Hamilton-st., Chas. J. Dunn; asphalt paving, Davis-st., Barber Asphalt Paving Company, $5,993; asphalt paving, Flushing-st., Uvalde Asphalt Paving Company.

Harrisburg, Pa.—The contract for paving and curbing Market-st., from the Canal to Cameron-st., was awarded Dec. 19 to the Barber Asphalt Paving Company at $1.98 a sq. yd., $1.23 a lin. ft. for granite curbing and 25 cents a lin. ft. for resetting curbing.

Laafyette, Ind.—Bids were received Dec. 15. for paving State-st., from Ellsworth to College-sts., as follows: Barber Asphalt Paving Company, $6.19 a lin. ft. or $8,990; Andrew Jaicks, $6.30 a lin. ft. or $9,350; Western Paving & Constr. Co., $5.98 a lin. ft. or $8,600.

Joplin, Mo.—Contracts have been awarded as follows: Curbing Joplin-st., from Second-st. to D., B. C. Hilsabeck, 57½ cents a foot; grading and macadamizing Eighteenth-st. from Byers-ave. to Jackson-ave., W. H. Mahoney $860; grading and macadamizing Cox-ave. from Taylor-st. to Bryan-ave., W. H. Mahoney $1,215.

Toronto, Ont.—The contract for furnishing scantling and curbing was awarded Dec. 9 to Reid & Co. at $17.39 per M for 4x4 pine and $15.39 for 4x4 cedar and $18.39 for 4x10 pine. The contract for broken stone was awarded to Alex Douglas at $1.30 a cubic yard. The Ontario Paving Brick Company secured the contract for paving brick at $15.50 per M.

Milwaukee, Wis.—The statement made in the December number of Municipal Engineering to the effect that the contract for paving the Sixteenth-st. viaduct with creosoted blocks had been forfeited by the Terre Haute Creosoting Company and had been given to the Republic Chemical and Creosoting Company of Indianapolis, is a mistake. The Terre Haute Creosoting Company is completing the work.

Buffalo, N. Y.—(Special)—Paving contracts have been considered as follows: Bradley-st. from Danforth to Reese-sts., brick, Louis H. Gipp, Ellicott square, $8,999; Chestnut-st. from Swan to N. Division-sts., Alcatraz asphalt, H. P. Burgard, 560 Walden-ave. Bids have also been received for paving Richfield-ave. from S. Park-ave. to S. Park boulevard, 4,890 square yards. Elam-place from Crescent-ave. to Greenfield-st., 1,372 square yards.; Roberts-ave. from Clinton-st. to Roesser-ave., and Ellicott-st. from Goodrich to St. Paul-sts. Frank J. Reap of Rochester submitted the lowest bid for retaining walls, wing walls, piers and roadway on Sprenger-ave. at Scajaquada creek at $2,924.

Spokane, Wash.—Bids were received Dec. 18 for street improvements as follows: Grading and curbing Sinto-st. from Division to Monroe-sts., Mitchell Bros., $5,200; A. Ilse, $7,756; Peter Costello, $8,240; cement sidewalks on same street: A. Ilse, $4,200; R. E. Lee, $4,350; Peter Costello, $4,374; J. C. Kennedy, $4,550; Sorenson & Stone, $4,995. Grading and curbing Ermina-st. from Pearl to Division-sts.: Adams & Hogan, $1,285; Peter Costello, $1,340; Mitchell Bros., $1,680; A. Ilse, $1,650. Asphalt sidewalks for same: Barber Asphalt Paving Company, $1,832; Grading and curbing Frederick-st. from Monroe to W. Oval-sts.: A. Ilse, $380; Peter Costello, $670; Adams & Hogan, $730; Mitchell Bros., $885. Cement sidewalks for same: R. E. Lee, $1,720; A. Ilse, $1,328; Iver Sorenson, $1,328; J. C. Kennedy, $1,328; Adams & Hogan, $1,375; Peter Costello, $1,340.

SEWERS.

Trenton, N. J.—Argument before the court of errors and appeals in the Passaic river pollution case was concluded Dec. 8.

Minneapolis, Minn.—This city has added eight miles of sewers to the sewerage system this year at a cost of $120,000. The city now has 169½ miles of sewer for which $2,000,000 has been expended.

Summit, N. J.—The committee appointed to investigate the alleged overcharges in the Euclid-ave. sewer construction work, submitted a report Dec. 2 declaring that city had been defrauded. The sewer was completed in May, 1902, and the contractor, J. T. Boylan of Belleville, charged and collected for 20,625 feet of timber and 71½ yards of rock. The report declares that the actual number of feet in the trench is 7,981, and of rock excavation three yards. The amount of overcharge is placed at $375.

CONTEMPLATED WORK.

Greensboro, N. C.—Sewage disposal is proposed for this place.

Ft. Scott, Kan.—A contract will be let soon for building a sewer.

Granada, Minn.—About 2,350 ft. of sewers have been authorized.

Emmettsburg, Ia.—Surveys are being made for a sewer system.

Bernardsville, N. J.—Surveys are being made for a sewer system.

Centralia, Ill.—Petitions are being circulated for a sewerage system.

Rockdale, Ill.—A sewerage system is desired according to press reports.

Mason City, Ia.—A lateral sewer in the Lime creek district is proposed.

Anaconda, Mont.—A new sewer dist., to run from W. Park-ave. to Eight-st., is proposed.

Shelton, Conn.—Sewers in Hill-st. and Prospect and Division-aves. are contemplated.

Rockford, Ill.—Council will be asked for an appropriation of $14,000 for building sewers.

Cedar Falls, Ia.—A sewerage system costing between $100,000 and $200,000 is contemplated.

Bowling Green, O.—A resolution was passed Dec. 8 to build a sewer on Buttonwood-ave.

Melrose, Mass.—The city voted to adopt a system of surface drainage. Sidney H. Buttrick.

Sault Ste. Marie, Ont.—The question of providing $45,000 for sewer extension will be voted on Jan. 5.

Vailsburgh, N. J.—An engineer will be appointed Jan. 7 to have charge of the local sewerage system.

Rochester, N. Y.—Ordinances have been passed for building sewers on W. Washington and Lacock-sts.

Fairhaven, Vt.—The construction of sewers is contemplated at a cost of $30,000. W. H. Preston, town clk.

Hazleton, Pa.—The cost of arching the Mill creek sewer is estimated by City Engineer Celiax at $8,574.

Belleville, Ill.—A sewer in W. Main-st. at a cost of $14,000 is contemplated. G. W. Beineke, cy. clk.

Penn Yan, N. Y.—Plans and specifications for a sewerage system are devised. J. A. Onderwood, president.

Fishkill Landing, N. Y.—This town voted Dec. 18 to expend $145,000 for building a sewer thirteen miles long.

Lake Charles, La.—Plans and estimates for a sewerage system have been submitted to the council.

Abington, Pa.—An ordinance for a general sewerage system is being considered by the Cheltenham township commissioners.

Fulton, N. Y.—A sewerage system on the West Side is needed and the board of public works is considering the matter.

Moscow, Idaho.—Otto Weile of Spokane, Wash., has been engaged to report a sewerage system for this place.

Atlanta, Ga.—The question of issuing $800,000 bonds for sewer and water works will be voted on in February.

Princeton, Ill.—The estimated cost of a sewerage system in the southwestern section of this city is $20,000.

Jersey City, N. J.—Plans for a six foot steel sewer to drain the Ravine road sewerage district have been made.

Allentown, Pa.—Council is considering an ordinance to create a debt of $500,000 for building a sewerage system.

Lewiston, Idaho.—A petition is being circulated to create a sewerage district to include the entire lower portion of the town.

Gloversville, N. Y.—Cy. Engr. Vrooman will make surveys, plans, etc., for 19,000 feet of sewer to be built in this city.

Meriden, Conn.—The council street committee has recommended the construction of 10,340 feet of sewer during 1903.

Ballard, Wash.—An ordinance was adopted Dec. 15 authorizing the issue of $20,000 bonds for building a sewer in Second ave.

Houston, Tex.—Plans are being prepared for altering the drainage system south of the bayou. Cy. Engr. Dormant.

Lancaster, O.—An ordinance has been passed to build a sewer on Park st. from Columbus-st. to the canal. Cy. Clk Mechling.

Peterborough, Mass.—A by-law is pending to borrow $20,000 for public improvements, $5,000 of which will be for drainage.

Ballard, Wash.—Bids will be asked for soon for constructing 1,628 feet of brick and 360 feet of pipe main sewer in Second-ave. G. P. James, Deputy City Engineer.

East Lake, Ala.—A sewerage system is contemplated at a cost of $25,000, which it is proposed will connect with the county trunk sewer.

Ottawa, Ill.—A plan for a sewerage system on the west side has been authorized and submitted to the property owners. Chas. F. Wilson, City Engineer.

Crookston, Minn.—The estimated cost of a sewer on Washington and Lincoln-aves. and Bridge-st. in Jerome's addition is $2,792. Geo. A. Ralph, City Engineer.

The question of issuing bonds for sewerage systems will be voted on at the following places: Mt. Vernon, N. Y., in March; Corinth, N. Y., in January.

Wichita, Kas.—The contract for making plans and specifications for the proposed storm water sewer will probably be awarded to Wynkoop Kiersted of Kansas City.

Ardmore, Pa.—The commissioners of lower Merion township will submit the question of borrowing $250,000 for building a sewerage system to a vote in February.

Contemplated: Levis, Que.; Attala, Ala.; Bryn Mawr, Pa.; Babylon, N. Y.; Edwardsville, Ill.; Normal, Ind.; Moscow, Idaho; Lebanon, Pa.

Reading, Pa.—An ordinance to appropriate $30,000 to build an intercepting storm-water sewer in the northeastern part of the city has been concurred in by the council.

Portland, Me.—An ordinance has been passed furnishing an estimate for the extension of the North Side intercepting sewer to Proble-st. Edwin M. Hunt, secy. B. P. W.

Toronto, O.—The board of control will ask the council to submit to vote the question of building a septic tank system of sewerage at a cost of $2,540,000.

Pasadena, Cal.—A resolution has been approved for building sewers on Lake, Moline, Madison and Oakland-aves. and California, Carter and Eldorado-sts. L. C. Turner, Supt. Streets.

Jersey City, N. J.—Resolutions have

been adopted for the reconstruction of sewers in Bay, Van Vorst, Essex and Second-sts. Plans will be prepared for sewers in Belmont and Garner-aves.

New York City—H. J. Reilly, 72 and 74 Trinity Place, will let contracts about the middle of January for material, pipe and machinery for a sewerage system to be built at Cienfuegos, Cuba.

Buffalo, N. Y.—(Special)—This city contemplates taking a piece of land 298x199 ft. on Hamburg-st. for a dry sewerage pumping plant, and $100,000 bonds will be sold soon to construct the plant.

St. Paul, Minn.—Plans are being prepared and contracts will be let this winter for constructing sewers at a cost of $250,000. The greater part of the sewers will bein the outlying districts.

Woonsocket, R. I.—Mayor Greene has signed ordinances appropriating $5,500 for new filter and sludge beds at filter fields; $4,150 for retaining wall and buildings a sewer on Park-ave., between Pine and Hague-sts.

Grand Rapids, Mich.—A resolution has been passed ordering the board of public works to reject all bids from the West Side ditch sewer and to readvertise for bids until Feb. 2, upon specifications for a brick and cement sewer.

Sault Ste. Marie, Mich.—The estimated cost of a sewer in Ashmore-st. is $23,500. A twenty-four-inch tile sewer in Portage-ave. and Spruce-st. and an eighteen-inch sewer between Spruce-st. and the water power canal is contemplated. Cy. Engr. McIlhargie.

St. Bernard, O.—The St. Bernard Improvement Association has recommended the construction of a trunk sewer through this village, and an arrangement with other villages in the valley for the extension of the system along Carthage pike.

Asbury Park, N. J.—The city council voted, Dec. 22, to accept Jas. A. Bradley's amended offer to sell the beach and sewers to this city, and voted to issue $300,000 thirty years 3½ per cent. bonds. The decision will be approved by a vote of the taxpayers on Jan. 12 and 13.

Newark N. J.—The plans for the joint sewer from the Passaic Valley sewerage commission have been completed. The engineer will recommend a trunk sewer 15 feet in diameter along the west bank of the Passaic river from Paterson to the meadows south of this city, where it will cross the Newark bay, thence to the south side of Morris canal to New York bay. Pumping stations may be necessary.

Crownpoint, Ind.—Preliminary steps are being taken in Laporte, Starke, Porter, Lake and Jasper counties to reclaim hundreds of thousands of acres of Kankakee marsh lands by constructing the largest artificial waterway of its kind east of the Mississippi river. The ditch will be eighty feet wide and sixteen feet deep. The total cost will be about $1,000,000. Payment will be made by assessment on benefits derived from the ditch.

CONTRACTS TO BE LET.

Fargo, N. D.—Bids are asked until 5 p. m. Jan. 5 for building a twelve-in. lateral sewer on Fifth st. Jr. H. J. Gibson, cy. audt.

Trenton, N. J.—Argument before the court of errors and appeals in the Passaic River pollution case was concluded Dec. 8.

Fort Wayne, Ind.—Sealed bids are asked until Jan. 8 for building sewers in certain alleys. Peter Eggemann, chmn B. P. W.

Cleveland, O.—Bids are asked until Jan. 8 for building an intercepting sewer in Lake-st. with a tunnel in Marquette-st. Chas. P. Salen, com'r. pub. wks.

Merced, Cal.—Bids are asked until Jan. 7 for a drain pipe in the Ashby and British colony road to the Landrant County road. W. H. Croops, clk.

Cincinnati, O.—Sealed bids are asked until 12 m. Jan. 2 for building a trunk sewer in the ravine west of Torrence road. Robt. Allison, prest. B. P. S.

Washington, D. C.—Sealed bids are asked until 12 m. Jan. 3 (postponed from Dec. 20) for the construction of a sewage pumping station. H. B. F. MacFarland, chm. Dist. Comrs.

Michigan City, Ind.—Sealed bids are asked until 5 p. m. Jan. 5 for constructing a twelve-in. tile drain in Lafayette-st. from Beakes-st. to the Romel ditch. Edw. J. Heise, cy. clk.

Minneapolis, Minn.—This city has added 8 miles of sewers to the sewerage system this year at a cost of $120,000. The city now has 169½ miles of sewer for which $2,000,000 has been expended.

New Britain, Conn.—Sealed bids are asked until 4 p. m. Jan. 6 for constructing section 2 of the sewerage system, consisting of 1,048 feet of tunnel, 680 feet of approaches, manholes, etc. S. H. Stearns, chmn. bd. sewer comrs.

New Orleans, La.—Sealed bids are asked until 12 m. Feb. 2 for constructing 96 mis. of sewers and appurtenances of which 7 mis. will be of brick or concrete and 89 mis. of 36 to 8-in. pipe sewers, with 1,100 manholes and 450 flush tanks. Geo. G. Earl, gen'l supt.

Fernandina, Fla.—Sealed bids are asked until Jan. 7 for a sewerage system, including 35,620 ft. of 15, 12, 10, 8 and 6-in. sewer, 12 ft. of 8-in. c. i. pipe, 30 manholes, 35 lampholes, 24 flushtanks, 18 piles in place, and 700 ft. b. m. timber in outfall. J. E. Starke, cy. clk.

Summit, N. J.—The committee appointed to investigate the alleged over charges in the Euclid-ave. sewer construction work submitted a report Dec. 2, declaring that the city had been defrauded. The sewer was completed in May, 1902, and the contractor, J. T. Boylan of Belleville, charged and collected for 20,625 ft. of timber and 71½ yds. of rock. The report declares that the actual number of feet in the trench is 7,981, and of rock excavation, 3 yds. The amount of overcharge is placed at $375

Columbus, O.—Sealed bids are asked until Jan. 6 for the construction of sewers complete with outlets, inlets, manholes, flushtanks, regulators and interceptors as follows: Central relief sewer, 5,531 ft. of 126, 117, 114, 108 ins. brick, and 18-in. vitrified pipe subdrain; Walnut-st. relief, 2,958 ft. 66, 54, 36-in. brick and 15-in. vitrified pipe and 24 and 6-in. c. i. pipe; West Side sanitary sewer, 26, 906 ft. 36 and 27-in. brick, 20, 18, 15, 12, 10 and 8-in. vitrified

pipe; Richard-ave. sanitary submain and laterals, 18,876 ft., 18, 15, 12, 10, and 8-in. vitrified pipe. The central and Walnut-st. sewers will require trenching machines. Clarence M. Addison, clk. B. P. W.

CONTRACTS AWARDED.

Tacoma, Wash.—The contract for constructing a sewer in Old Town was awarded to E. M. Moore for $2,100.

Listowal, Ont.—The contract for building sewage disposal works was awarded to P. Pigeon of Sebringville for $5,710.

Erie, Pa.—Contracts for building sewers in Holland and Wallace-sts and Brown's ave. were awarded to Edward Driscoll.

Vincennes, Ind.—The contract for a sewer in St. Clair-st. was awarded to D. W. Norton & Co. of Terre Haute for $14,703.

Nashville, Tenn.—J. W. Quinn was awarded the contract Dec. 6 for a sewer in an alley between Church and State-sts. for $673.

Tuscaloosa, Ala.—W. A. McCalla & Co. secured the contract Dec. 4 for building a new sewer under the embankment on Broad-st. and Twenty-first-ave.

Cincinnati, O.—McCarthy Bros. secured the contract for a sewer on Price Hill, Enright-ave., W. Eighth-st., Wells and other streets for $6,016.65.

St. Louis, Mo.—The contract for reconstructing the Mill Creek sewer was awarded Dec. 11 to Herman Bros.' Construction Company at $16.90 a ft.

Milwaukee, Wis.—The contract for 1,550 ft. of section 4 of the Kinnickinnic flushing tunnel was awarded Dec. 5 to R. W. Forrestal at $38 a lineal ft.

Pasadena, Cal.—A. S. Bent was awarded the contract for building sections one and two of the East Side outfall sewer for $4,650, and Howard & Frick section three for $3,495.

Buffalo, N. Y.—(Special.)—The contract for constructing an eighteen, twelve and ten-inch tile sewer in Pauline, Gest and Sandford-sts has been awarded to Rappich & Culliton, 2293 Main-st. for $1,175.

WATER-WORKS.

Newark, N. J.—Work on the new reservoir at Cedar Grove was suspended Dec. 10 for the remainder of the winter.

Cleveland, O.—The water works tunnel under Lake Erie was completed Dec. 6. The tunnel has been under construction for six years.

Columbus, Ga.—The Columbus Water Works company has passed into the hands of a receiver on the application of the Mercantile Trust & Deposit Company of Baltimore.

Memphis, Tenn.—The Artesian Water Company officially accepted Dec. 8 the proposition of this city to purchase its plant. More than $3,000,000 is involved in the deal.

East Orange, N. J.—The city council has rejected the award of the condemnation commissioners fixing $425,000 as the value of and the price to be paid for the plant of the Orange Water Company.

Nebraska City, Neb.—The main channel of the Missouri river shifted suddenly to the Iowa side Dec. 6, leaving this city without a water supply. The water mains were drained and every basin left empty.

Bakersfield, Cal.—The construction of a series of levees is contemplated by the oil companies in the Kern river field, to prevent the pollution of water in the Kern river. The water will be collected in ponds and then drawn off from the bottom and the oil collected.

Jonesboro, Ark.—The council has adopted a resolution to secure, if possible, an amendatory act to authorize municipal corporations to purchase water and light plants, telephones and other utilities, as well as to construct same. The present law provides for the construction only of these industries.

New York City—An appropriation of $100,000 has been authorized for the investigation of the water supply of this city. It is understood that $36,000 will be paid the three engineers recently appointed to make the investigation. Prof. William H. Burr, Rudolph Hering and John R. Freeman, and that $64,000 will be available for assistance outside that rendered by the department of water supply, gas and electricity.

CONTEMPLATED WORK.

Fostoria, O.—A municipal water works plant is proposed.

Watertown, S. D.—A municipal water works plant is proposed.

Bozeman, Mont.—The improvement of the water mains is proposed.

Horseheads, N. Y.—Plans for gravity water works have been completed.

Adams, Ore.—The construction of a water works system next year is proposed.

Denver, Col.—Preliminary surveys are being made for storage reservoirs.

Lakeland, Fla.—The question of building a water works system is being agitated.

Rockford, Ill.—Petitions have been received for laying 28,000 ft. of water mains.

Aguascalientes, Mexico—Plans for a water works and sewerage system are being made.

Baltimore, Md.—The water board approved, Dec. 17, the specifications for meters.

Blackduck, Minn.—A water tower and tank, with mains, will be constructed for fire protection.

Springfield, Utah.—The question of issuing bonds for a new pumping plant will be voted on.

Cincinnati, O.—The water mains will be extended in C. C. Bragg's subdivision on Woodburn-ave.

New York City—The special water commission favors the installation of a meter system.

Wausau, Wis.—A filtering plant has been recommended by Prof. E. G. Smith of Beloit college.

Pittsburg, Pa.—The residents of the Twenty-second ward have petitioned for the extension of the water mains.

Lansing, Ia.—Plans and specifications

for water works have been prepared. N. A. Nelson, cy. clk.

Helena, Mont.—This city voted to issue $614,000 bonds to buy or build water works. Mayor Edwards.

Bethany, W. Va.—This city wants an engine, dynamo, boiler and pump. T. E. Cramblet is interested.

Alton, Ill.—The citizens in the outlying districts are demanding an extension of the water works system.

Ottumwa, Ia.—The question of making a contract for a temporary water supply will be voted on Jan. 12.

Cuero, Tex.—This town voted Dec. 16 to issue bonds for the extension and improvement of the water mains.

San Juan, Cal.—The city trustees will engage an engineer to estimate the cost of building a dam and reservoir.

Granger, Texas.—Bids are advertised for pipe, hydrants, gasoline engines, tanks, etc. Granger Water Company.

Gloucester City, N. J.—An ordinance passed second reading Dec. 11 for issuing bonds for improving the water works.

Richfield, Utah.—Plans and specifications for a new water works system will be made by P. D. Schoeber of Salina, Kas.

Carthage, Mo.—The question of constructing municipal water works is being agitated by the citizens. Mayor Chaffee.

San Bernardino, Cal.—This city voted Dec. 20 to issue bonds for building an extensive municipal water works system.

The extension of water mains is proposed at the following places: Seattle, Wash.; Tekoa, Wash.; Portsmouth, N. H.; Canton, O.

Ashland, O.—An ordinance has been passed authorizing the issue of $8,000 bonds for improving the water works system.

Fargo, N. D.—This city contemplates the filtration of the Red River water or securing a water supply from a lake thirty-five miles east.

New York City.—H. J. Reilly, 72 and 74 Trinity Place, will let contracts about the middle of January for a water works system in Cienfuegos, Cuba.

Salt Lake, Utah.—An immense storage reservoir in Minersville canyon, to develop a water supply for Beaver County, is proposed.

Toronto, Ont.—The city council has decided to appropriate $ for a 15,000,000 gallon pumping engine, according to press reports.

Manly, N. C.—W. O. Ruggles and associates will establish a health resort and village and will build a water and electric light plant.

Watertown, N. Y.—City Engr. McComb submitted his report Dec. 22 on the proposed new water supply system. Several plans are suggested.

Niagara Falls, N. Y.—(Special.)—Walter McCullough, cy. engr., has recommended new water works with filtration plant at a cost of $500,000.

Springfield, Mass.—The water commission contemplates engaging an engineer to prepare plans for an increased water supply. N. D. Winter, Mem. Com'n.

Trenton, N. J.—The immediate construction of a filtration plant at the reservoir is urged by Dr. A. S. Fell, health officer. F. B. Lee, chm. com.

Philippi, W. Va.—The Philippi Water & Light Company has been incorporated to build a water works and electric light plant. S. H. Bowman interested.

Portland, Ore.—A water works system for Milwaukee, a suburb of this city, is contemplated. F. H. Lechler, chmn. water com., Milwaukee, P. O. Portland.

East Orange, N. J.—This city contemplates the employment of an engineer to do the preliminary work in the establishment of a new water works system.

New Orleans, La.—An ordinance was passed Jan. 10 directing the New Orleans W. W. Company to extend its water mains on Magazine-st. and to erect 15 plugs.

Muskegon, Mich.—Mayor Morgan and Supt. Kreuger of W. W. Dept. and the council are considering the feasibility of installing an additional pump at the water works plant.

Flagstaff, Ariz.—(Special.)—L. W. Quinlan, clk., says that the question of issuing $10,500 supplementary water works bonds carried Dec. 8. The sewer bonds were defeated.

Medina, N. Y.—(Special.)—Reports have it that Mr. A. L. Sweet has completed his plans for a storage dam to furnish a head to generate power. The dam is to be 52 ft. high and 540 ft. long.

Ballard, Wash.—Business Men's Association has asked council to advertise for bids for the salt water main along the water front, for the protection of the mills. Bids will be asked for at once.

The question of issuing water works bonds has been favorably voted on as follows: Fair Haven, Vt.; Newman Grove, Neb.; Lake Wilson, Minn.; Two Harbors, Minn.; Terry, O. T.; Algoma, Wis.

The question of issuing bonds for constructing water works systems will be voted on in the following places: Liberty, Mo.; Woodville, Minn.; Durant, I. T.; Schuylkill, N. Y.; Wilmont, Minn.

Columbus, Ga.—(Special.)—Robert L. Johnson, supt. pub. wks., says that this city voted Dec. 4 to issue $250,000 4 per cent. bonds for building and operating a municipal water works system.

Buffalo, N. Y.—(Special.)—Francis G. Ward, com'r. pub. wks., has been directed to ask for bids for 10 boilers, 10 stokers, brick work around boilers, fittings for 10 boilers and a coal conveyor to be placed in the water works pumping station.

Kansas City, Mo.—The bd. of pub. wks. is considering a proposition for building a new water plant on the Clay county side of the Missouri river. This would necessitate the abandonment of the Quindaro and Turkey creek pumping stations.

New York City.—An appropriation of $515,000 was made Dec. 19 for improving the water supply system. Of this $400,000 is for improvements in reservoirs and lands taken for the Manhattan and Bronx supply; $13,500 for improvements to pumping stations in Queens, $100,000 for remodeling and consolidating the present

Gravesend and New Utrecht pumping station in Brooklyn.

The construction of water works is contemplated at the following places: Arcola, Ill.; Canada, Kas.; Gridley, Ill.; Dexter, Me.; Ashfield, Mass.; Little Falls, N. J.; Marion, S. C.; Neosho, Mo.; Buffalo, Minn.; St. Maries, Idaho; Lawrenceburg, Tenn.; Obion, Tenn.; Wrentham, Mass.; Geneva, Ala.; LaFollette, Tenn.; Taylorville, Ky.; Lake Wilson, Minn.; Normal, Ind.; Woodstock, Ont.

CONTRACTS TO BE LET.

Havre, Mont.—Bids are asked until Jan. 31 for constructing water works. City Council.

Wessington Springs, S. D.—Bids are asked until Jan. 5 for sinking an artesian well. Geo. R. Bateman, town clerk.

South St. Paul, Minn.—Bids are asked until Jan. 5 for a standpipe and water mains. Chas. W. Clark, city recorder.

Centerville, Miss.—Sealed bids are asked until 2 p. m. Jan. 7, for constructing a water works system. Ackland H. Jones.

South Brooklyn, O.—Bids are asked until Jan. 12 for laying water mains on several streets. W. T. Pupikofer, village clerk.

Fort Snelling, Minn.—Bids are asked until Jan. 15 for constructing a new water works plant. Ch. Q. M., Army Bldg., St. Paul.

Los Angeles, Cal.—Bids are asked until Jan. 5 for a double acting duplex pump, and for an inverted vertical engine. Domestic Water Company, 322 Wilcox Bldg.

Evans, Col.—Bids are asked until Jan. 20 for constructing the outlet ditch of the Union Reservoir Company, including head gates. Jas. L. McCain, secretary.

Centralia, Ill.—Sealed bids are asked until 7 p. m., Jan. 6, for laying a six-inch water main and two hydrants on E. Broadway-st. A. J. Sliger, chairman water committee.

Searcy, Ark.—Bids are asked until Feb. 1 (postponed from Dec. 26) for constructing a water works and electric light plant. Emmet Snipes, secy. com'n.

Long Island City, N. Y.—Bids are asked until Jan. 2 (extension of date) for laying water mains on several streets on Boro of Queens. Robert Grier Monroe, water comr. N. Y. City.

New York City—Bids are asked until Jan. 2 for laying water mains in Grand, Fulton and Prince-aves., and Main, Munson and Locust-sts. ,and First ward boulevard, Queens Boro. Robert Grier Monroe, com'r.

Ardmore, I. T.—Bids are asked until Jan. 6 for pumping machinery, fire hydrants, gate valves, valve boxes, steel water tower, laying twelve miles of mains and constructing a pumping station. R. W. Dick, mayor.

Abilene, Tex.—Bids are asked until 10 a. m. Jan. 3 for putting in machinery and complete apparatus for power, electric lights, water supply system and steam heating at the Epileptic Colony. W. P. Preston, supt. bldgs.

Milwaukee, Wis.—Bids are asked until Jan. 3 for constructing brick conduits on two avenues under the depressed tracks of the C. & N. W. railway in Eighteenth ward, for the reception of the large water mains. Charles J. Poetsch, chmn. pub. wks.

Kansas City, Mo.—Sealed bids are asked until 3 p. m. Jan. 2 for installing three pumping engines, as follows: One 15,000,000 gal. engine at Turkey Creek station; one 12,000,000 gal. engine at Turkey Creek station; one 12,000,000 gal. engine at Quindaro station Baxter Brown, secy. B. P. W

CONTRACTS AWARDED.

Mountainhome, Idaho.—A franchise for water works has been granted. Dr. J. W. Nieukirk.

Roland, Ia.—The contract for building a water works system was awarded to Olsen & Larson of Des Moines.

Cumberland, Ia.—The contract for a water works system was awarded to S. G. Hunter of Atlantic for $5,300.

Schulenburg, Tex.—The contract for building a water works system has been awarded to the Guenther Foundry Company of San Antonio.

Niagara Falls, N. Y.—Carmine Crogan was awarded the contract Dec. 19 for constructing a water main in Niagara-ave. for $2,198.

Hawkesbury, Ont.—The contract for building water works and sewerage systems was awarded to Thomas McLaughlin of Ottawa for $70,000.

Renton, Wash.—The Washington Pipe and Foundry Company of Tacoma secured the contract Dec. 17 for building the water works system here for $4,750.

Providence, R. I.—The contract for furnishing special castings, iron work for sewers, etc., was awarded to the Builders' Iron Foundry of this city.

Benton Harbor, Mich.—The board of public works has voted to purchase a pump from the Engberg Mechanical and Electrical Works of St. Joseph, Mich., for $875.

Troy, N. Y.—The contract for water works extension was awarded Dec. 9 to T. H. Gillespie of New York City for $359,360. The work involves the construction of the Tonhannock conduit line.

Ottumwa, Ia.—The contract for furnishing and laying pipe for the city water works was awarded Dec. 4 to the United States Cast Iron Foundry Company of Chicago as follows: Six-inch iron pipe, 46c per foot; laying 8-inch pipe, 48c per foot; 12-inch pipe, 54c per foot; 14-inch pipe, 68c per foot; 16-inch pipe, 65c per foot.

BRIDGES.

St. Paul, Minn.—A bridge from Jackson to Eaton-st. is proposed.

Elbridge, Ill.—A bridge will be built across Sugar Creek in this township.

Huron, O.—The rebuilding of the St. Clair-st. bridge is proposed.

Fall River, Mass.—A bridge between this city and Somerset is again proposed.

Mt. Carroll.—Elkhorn Grove township voted to issue $3,000 to build a bridge.

Covington, Ky.—The construction of a viaduct over Third-st. has been recommended.

Port Huron, Mich.—A Cantilever bridge at Military-st. is favored by Mayor-elect Graves.

Essex, Mass.—A steel bridge is proposed to replace the wooden structure at Main-st.

Trenton, N. J.—A bridge over the canal between the Cass and Lalor-st. bridges is contemplated.

Berkley, Va.—A steel bridge across Pasacara creek at Maple-ave. is proposed by the board of supervisors.

McKee's Rocks, Pa.—The council has voted to build a bridge across Chartier's creek at Singer-ave.

Springfield, O.—A new bridge over the Mead river, near Enon, is proposed by the county commissioners.

Oshkosh, Wis.—Bids will be received Jan. 5 for a bridge to be built across Sawyer creek. Board of public works.

Kokomo, Ind.—The county commissioners contemplate building a bridge over the Wabash river and one over Charley creek.

Arkadelphia, Ark.—Plans and specifications have been submitted for a steel bridge to be built across the Ouachita river.

Milwaukee, Wis.—The board of public debt commissioners have approved a bond issue of $150,000 for a bridge to Jones' island.

Newton, Ia.—Bids are asked until Jan. 5 for furnishing bridge material for the ensuing year. Joe Horn, county auditor.

Duluth, Minn.—Estimates are being prepared by the city engineer of the cost of replacing thirty-five bridges in the Eighth ward.

Fairmount, W. Va.—A new bridge across the Monongahela river at Washington-st. to replace the present structure is proposed.

Rensselaer, N. Y.—Petitions have been circulated for a new wagon bridge and foot bridge across the railroad tracks at Third-ave.

Cincinnati, O.—The cy. engr. has been directed to make plans, spec. and est. for a viaduct from the end of Fourth-st. to Mt. Adams.

Fort Collins, Col.—Sealed bids are asked until Jan. 15 for constructing thirty four bridges in the Big Thompson road John E. Ramer, co. clk.

North Tonawanda, N. Y.—The town bd. is discussing the matter of bldg. a new bridge across the Two Mile creek on the river road.

Buffalo, N. Y.—(Special.)—The Penn. R. R. Co. contemplates strengthening all its bridges on the Buffalo & Allegheny branch and to rebuild some of them.

Trenton, N. J.—The construction of a bridge across the canal connecting the plants of the Trenton Fire Clay & Porcelain Company and the Mott Iron Company is contemplated.

Utica, N. Y.—The Schuyler-st. bridge across the Mohawk river has been pronounced unsafe and will have to be strengthened for the present. A new one will be built later.

Bay City, Mich.—Steel floors are proposed to take the place of the present wooden floor system of the Cass and Lafayette-ave. bridges, Blomsheld & McCloy, cons. engrs., city

Sacramento, Cal.—Bids are asked until Jan. 6 for building a joint steel bridge over the Mokelumne river, between Sacramento and San Joaquin counties. W. B. Hamilton, clk.

Peoria, Ill.—Sealed bids are asked until 12 m. Jan. 27, 1903, for erecting a 65 ft. span combined concrete and steel bridge over Farm creek on East Peoria road. R. M. Orr, cy. clk.

Providence, R. I.—A resolution has been passed by the city council authorizing the issue of bonds for building a bridge and retaining walls in the rear of the postoffice site on Exchange-place.

San Antonio, Tex.—An ordinance was passed Dec. 15, requiring the Southern Pacific R. R. to build a viaduct over Walnut-st., or any street to be selected by the mayor.

Milwaukee, Wis.—The committee recommended Dec. 23 that bids be asked for the W. Water-st. bridge. The contract for the Muskego-ave. bridge was awarded to the Milwaukee Steel Structure Company for $93,800.

Scranton, Pa.—(Special.)—Sealed bids are asked until 3 p. m. Jan. 12 for constructing a viaduct on W. Lackawanna-ave., from Seventh to Ninth-aves., across and over the D., L. & W. R. R. tracks. John E. Roche, dir. dept. pub. wks.

Elkton, Md.—The Pennsylvania and B. & O. R. R. companies are planning to build a large combination bridge over the Susquehanna river at a point about midway between two bridges now operated by the companies. A wagon driveway will be provided.

Brookville, Ind.—Sealed bids are asked until 2 p. m. Jan 6, as follows: Superstructure of 40 ft. span steel bridge over Plummer creek; substructure for bridge over Plummer creek; superstructure for 100 ft. span six-panel steel bridge over Richland creek. Bd. Co. Comrs.

Kansas City, Mo.—The Kansas City and Clay County Toll Bridge Company has been incorporated to build a bridge across the Missouri river from the foot of Holmes-st. in this city to the public highway of the fair grounds boulevard on the Clay county side of the river.

HEAT, LIGHT AND POWER.

Hancock, Mich.—A municipal light plant is proposed.

Milwaukee, Wis.—A municipal electric light plant is proposed for this city. Mayor Rose.

Boston, Mass.—An ordinance has been introduced for establishing a municipal light plant.

Milwaukee, Wis.—The question of a municipal light plant is receiving favorable consideration.

Crystal Falls, Mich.—Bids are asked

until Jan. 10 for two generators, etc. Robert Munns, clk.

Edwardsville, Pa.—A franchise has been granted the Shawnee Electric Light Company of Plymouth.

Hartford, Conn.—A committee will be appointed to investigate the question of a municipal light plant.

Washington, Ill.—A company may be organized to install an electric light plant. C. A. Waltmire, interested.

Grinnell, Ia.—The question of granting an electric light and heating plant will be voted on Jan. 15.

Red Jacket, Minn.—A 30-yr. franchise for lighting and heating this city has been granted John Burder.

Oconto, Wis.—The contract for street lighting was awarded Dec. 4 to W. A. Holt, at $75 per light.

Lapeer, Mich.—An electric light plant will be established here by Henry Schlegel and F. E. Hatch of Detroit.

Canon City, Col.—A tranchise for building and operating a gas plant has been granted H. A. Black of Pueblo.

The question of issuing bonds for electric lighting will be voted on as follows: Orange, Cal.; Danville, Ky.

Depew, N. Y.—(Special.)—The board of trustees have granted a franchise to the Lancaster & Depew Natural Gas Company.

Manly, N. C.—W. O. Ruggles and associates will establish a health resort and village and build an electric light plant.

Hastings, Minn.—The Hastings Electric Light and Power Company will change its lighting system to 40 2,000 c. p. arc lights.

Quincy, Ill.—The contract for lighting the streets was awarded Dec. 15 to the Quincy Gas and Electric Company for three years.

Winona, Minn.—Sealed bids are asked until 8 p. m. Jan. 5 for constructing an electric light plant. G. P. Coleman, cy. engr.

Renville, Minn.—W. O'Connor is a member of a committee to consider the question of installing an electric light plant.

Jellico, Tenn.—The Jellico Electric Light, Heat and Power Company has been incorporated to furnish electric light and power to this city.

Buffalo, N. Y.—(Special)—The city and county hall trustees have recommended that electricity be installed in the hall instead of gas.

Mexico, Mo.—A committee is investigating the question of a municipal lighting plant. S. J. Buckner, chmn. com.; H. C. Sandfort, cy. clk.

Concord, N. C.—A franchise for an arc and incandescent electric plant has been awarded to Thos. A. Scott and Reuben Barton of Richmond, Va.

Eminence, Ky.—A franchise has been granted the Uniontown Electric Light and Power Company of Uniontown, Ky., to furnish 25 arc lights of 1800 c. p.

Detroit, Mich.—The contract for 300 arc lamps and 4 transformers have been awarded to the General Electric Company of New York, for $8,100.

Chambersburg, Pa.—The city finds that it will be necessary to replace the 5 arc light machines with 143 arc lamps at the municipal plant.

Springfield, Tenn.—The contract for an electric light system has been awarded to the Union Machine Works of Nashville for $11,000.

Batavia, N. Y.—(Special.)—The board of managers for the state for the blind will erect a power house, heating plant and laundry at a cost of $30,500.

Richmond, Va.—A resolution has been introduced in the city council to consider the feasibility of constructing a municipal lighting plant.

Reinbeck, Ia.—Bids will propably be received March 10 for an electric light plant. W. P. Walch, Supt. Steam, Heat, Light & Power Company, Grunder Center, Ia.

Portland, Or.—Sealed bids are asked until Jan. 9 for the erection of Brown's Point light station, Washington. W. C. Langfitt, capt. corps of engrs., U. S. A.

Kansas City, Mo.—The board of public works has accepted the offer of the Kansas City Electric Light Company to furnish lights to the city at $65 per light per year.

Baton Rouge, La.—The contract for lighting the streets for a term of five years was awarded Dec. 3 to the Home Company at $80 per light for all-night service.

The question of issuing electric light bonds has been favorably voted on as follows: Algoma, Wis.; Barnesville, Ga.; Lewisburg, Tenn.; Clarence, Mo.

Palestine, Tex.—A fifty-year franchise has been granted to Messrs. Treadwell of St. Louis and Gray of Texarkana for an electric light plant and street railway system.

Chattanooga, Tenn.—The board of public works decided Dec. 24 to request the joint committee on permanent improvements to include in its bonds $115,000 for a municipal lighting plant.

Vincennes, Ind.—Bids are asked until 2 p. m. Jan. 5 for furnishing and placing gas and electric light fixtures in the county jail and sheriff's residence. J. D. Williams, co. audt.

Sag Harbor, L. I.—The contract between this village and the Electric Light Company has been annulled on account of the failure of the latter to furnish the current for lighting the streets.

Neenah, Wis.—Mayor Charles Schultz of this city and Mayor George Banta of Menasha, are appointing committees to meet in this city Jan. 21 to discuss a joint municipal lighting proposition.

Manila, P. I.—Bids are asked until March 4 for the purchase of a fifty-year franchise for a street railway, light and power plant. Col. C. R. Edwards, ch. Bureau Insular Affairs, Washington, D. C.

Philadelphia, Pa.—An ordinance has been passed granting the Philadelphia ElectricCompany permission to construct, acquire, maintain and operate a system of electric lighting, heat and power.

St. Paul, Minn.—The contract for furnishing gasoline lights, and furnishing and maintaining the lamps for the gas

lights was awarded Dec. 18 to the Cleveland Vapor Light Company at $26.50 per lamp.

Chicago, Ill.—American methods of making illuminating and fuel gas will be introduced in Paris, London, Brussels and other European cities by C. K. G. Billings and other American capitalists.

Oneida, N. Y.—The contract for lighting the streets for two years was awarded, Dec. 16, to the Madison County Gas and Electric Co., at $6,500 a year, less the amount deducted on account of lamps not burning.

Kenmore, N. Y.—(Special.)—The contract for installing a gas system has been awarded to John B. Winters, 94 Amherst-st., Buffalo, at 16 cents a lineal foot for four-inch pipe; $25 for setting lamp posts; $1 for syphons.

Newport, R. I.—Sealed bids are asked until Jan. 7 for constructing, plumbing, electric wiring and installing hot water heating system in a twelve-bed brick hospital at Ft. Greble. Capt. Thos. H. Slavens, Q. M., 209 Thames-st.

Albany, N. Y.—Sealed bids are asked until Jan. 30 for electric lighting, plumbing, gas-piping and heating of the library building at the State Normal School at Genesee. Chas. R. Skinner, St. Supt. of Pub. Instruction.

The construction of electric light plants is contemplated at the following places: Odebolt, Ia.; Manhattan, Ill.; Chanute, Kan.; Elizabethville, Pa.; Illwaco, Wash. Bridgewater, S. D.; Normal, Ind.; Lynville, Tenn.; Lawrenceburg, Tenn.; Obion, Tenn.; Buffalo, Tenn.; Perryville, Mo.; Cheraw, S. C.; Attalla, Ala.

St. Louis, Mo.—The contracts for installing electric light plants at the city hall and insane asylum have been awarded as follows: City hall, Westinghouse Mfg. Co., lighting apparatus, $12,750; engine, Chase Engine Mfg. Co., $13,453; insane asylum, Frank Adams Electrical Co., electrical apparatus, $5,689; Brownell & Co. of Dayton, O., engines, $3,330.40.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Duluth, Minn.—A snow plow will be purchased soon at a price not to exceed $100. St. Comr. Brennan.

Marietta, O.—The contract for a crematory has been awarded to the Dixon Garbage Company of Findlay, O., for $15,000.

Ft. Dodge, Ia.—A proposition for the construction of a garbage disposal plant has been made to the council by the International Waste Utilization Company.

Newark, N. J.—The contract for collecting and disposing of garbage and refuse has been awarded to Benj. Meyer of this city, who will erect an Arnold-Edgerton garbage reduction plant.

Buffalo, N. Y.—(Special.)—The board of public works has been directed to prepare plans and specifications and ask for bids for the removal of snow and ice from the streets and public grounds.

Kansas City, Mo.—A number of proposals have been received for removing and disposing of the garbage of this city. Dr. Langvale and a special committee, Aldermen Meirs, Tyree, Umbarger and Hedrick, are interested.

New Bedford, Mass.—(Special.)—L. J. Hathaway, jr., says that this city voted Dec. 2 to establish its own street sprinkling plant. This city has eighty miles of improved streets to be covered. Charles S. Ashley, mayor.

PARKS.

Nashville, Tenn.—The Nashville Railway has transferred Central park, containing 75 acres, to this city.

Wilmington, Del.—The city council passed three ordinances Dec. 18 for the purchase of additional park lands.

Rochester, N. Y.—An ordinance is pending providing that property north of Reservoir-ave. be transferred to the park board as an addition to the park system.

FIRE APPARATUS.

Duluth, Minn.—The purchase of a new hook and ladder is contemplated.

Pittsburg, Pa.—An appropriation of $12,000 is proposed for the purchase of apparatus for the fire department.

Huntington, Ind.—Daniel Schaeff, chmn. fire dept. com. has been authorized to purchase 500 additional feet of hose.

Paterson, N. J.—A purchasing committee will be appointed for the purpose of purchasing two new fire engines. Mayor Hinchliffe.

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